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# AGRICULTURAL ENGINEERING

The Journal of the American Society of Agricultural Engineers

APRIL 1929

Structural Standards for Animal Shelter Buildings . . . . . *J. L. Strahan*

Dairy Barns from a Manufacturing Point of View . . . . . *H. B. White*

The Development of Research in Farm Structures . . . . . *Henry Giese*

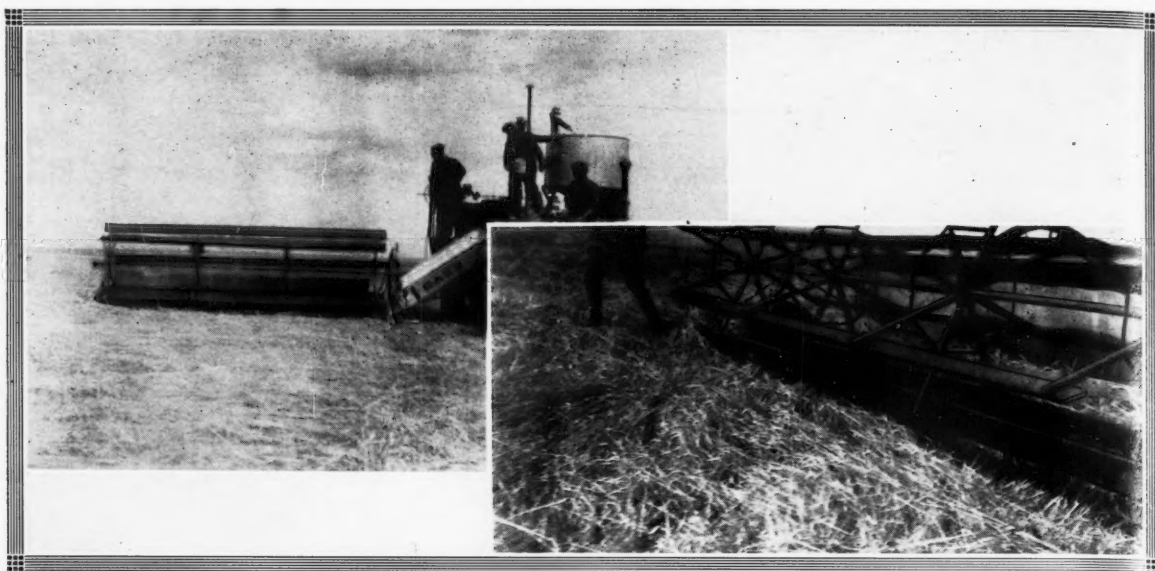
Natural Draft Dairy Stable Ventilation . . . . . *Howard W. Riley*

Recent Developments in Heat-Treated Clay Aggregates . . . . . *T. H. Merriam*

The Evolution of the American Farm House . . . . . *Rexford Newcomb*

VOL. 10—NO. 4





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Grain Binders  
Corn Binders  
Mowers  
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# AGRICULTURAL ENGINEERING

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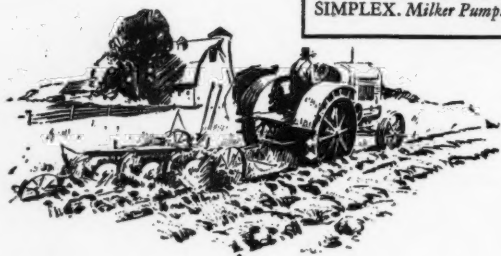
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# AGRICULTURAL ENGINEERING

Vol. 10

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## The Need of Structural Standards for Animal Shelter Buildings<sup>1</sup>

By J. L. Strahan<sup>2</sup>

IN PAST years the Structures Division of the American Society of Agricultural Engineers has been interested in a wide variety of subjects pertaining to construction on the farm, such as farm house design, fire protection for farm buildings, ventilation, structural design of large and small barns, household equipment, sanitation and many others.

Much good work has been reported and material is available in the form of committee reports, special articles and the publication of Society proceedings. These are all live subjects, and worthy of every effort looking toward their development. It is hoped that nothing we attempt at this meeting will be construed as minimizing the importance of any such phases of farm structures work. We have built a program around one rather limited subject. This has been with the thought that only by concentrating the energies of committees of the Division upon one single project at a time can definite achievement be expected.

We hope through the presentation of this program to focus the attention of those agricultural engineers interested in structures work upon a problem which seems to be easily within reach of solution by a properly coordinated effort of members of the Division extending through a comparatively short period of time.

The problem I have in mind is the preparation of structural standards for animal shelter buildings and their recognition as such by the American Society of Agricultural Engineers. Suggestions for a method of attack upon this problem will be presented, to which all who are even remotely interested are cordially invited to contribute.

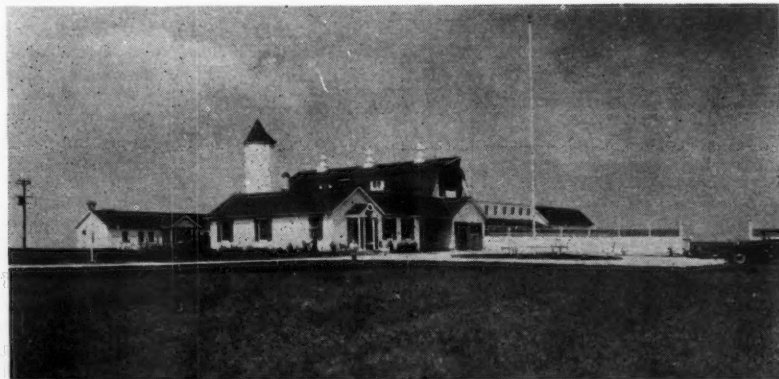
The establishment of such standards calls for a review of the present status of all available structural materials. Without question all materials, whether concrete, wood, tile, steel or other manufactured products, have their proper place and use in farm construction. Of special

interest at the present time are some new materials that promise to offer possible solutions of some of our difficulties, and to this end we are most anxious to secure the cooperation of industries interested in such products through active contact with their engineer representatives. This materials phase of the work is exceedingly important, second only perhaps to one other, namely, the formulation of requirements to be met in design.

Those of our members interested in structures from a design standpoint must come to an agreement as to precisely what constitutes the design problem. This in itself is a job of no mean proportions. It requires that the opinions of all qualified persons both inside and outside our membership must be weighed, evidence must be collected, data on various factors of design must be tabulated and properly correlated so that out of this study there can be crystallized a statement of requirements that may be agreed upon as representing the best authority obtainable in the light of present day knowledge and experience. This statement will form the basis for design. It will be something tangible, something capable of being used as a tool to manipulate the various factors concerned in animal shelter design to the end that most efficient buildings will be developed.

It will be argued that this is the province of the research specialist. The answer to this argument is that it most emphatically is. But the problems concerned are of such a nature that precise solutions can result, if at all, only from long time experimental effort. Furthermore, they are problems, the solutions of which have frequently been found in practice with a very fair degree of accuracy by the time-honored and very human method of cut and try. Again these problems are being faced every day by persons who, because the expense involved is usually high, should not be called upon to cut and try, but who must meet their situations as best they may with what advice or misadvice may be available.

Faced as we are with a definite and pressing need and having at hand a possible means for its solution which, while it may not be in all respects the most de-



The development of structural standards, which the agricultural engineers have undertaken, will save farmers the expense of "cut and try" attempts to meet the shelter needs of their enterprises.

<sup>1</sup>Preliminary remarks of the Chairman at the opening session of the meeting of the Structures Division of the American Society of Agricultural Engineers, at Chicago, December, 1928.

<sup>2</sup>Agricultural engineer, manager of the agricultural engineering department, Loudon Machinery Co. Mem. A.S.A.E.

sirable, is nevertheless the only immediately available one, have we any excuse for prolonging the agony; for putting off the job till our tools are perfected; for waiting on the results of long time experimental projects? Speaking as an agricultural engineer and as a member of the Structures Division of the American Society of Agricultural Engineers, I maintain that the situation constitutes a challenge that we should not fail to heed. Here is a job to do. Here are the means for doing it. Let's do it!

Our problem has to do with design. It has to do with construction. It has to do with research, because, while our immediate objective in all probability cannot at present be subject to the findings of strict research, it will always be subject to modification by such findings. Sound research was never more necessary than it is today. Research that is fundamental as well as practical will always

be an essential guide to the perfection of methods and practices. Because these three phases—design, construction and research—are so closely related in our immediate problem we are to hear today from men who have done outstanding work in each of them.

In farm building work I believe it is true that experimental work has practically all been done by the farmer and at very great expense. Changing conditions have been met with changes in design types. Barns have been developed through a slow process of adaptation to special conditions, and because a building is a long-lived thing development has suffered a serious lag behind conditions. But in the main these design problems have been worked out more or less satisfactorily in actual practice on actual farms. To the farms therefore we must go to find not only the statement of a design problem but also in part its solution.

## The Need of Standardization in Farm Construction Practice<sup>1</sup>

By Frank P. Cartwright<sup>2</sup>

A SOUND policy as regards farm building problems is much needed. It must be developed and adhered to.

The purpose of this meeting, as I understand it, is to crystallize such a policy and to make some arrangements by which it can be realized.

The first step, it would seem, is to take stock of where we are and what we have. A variety of farm structures are employed for different purposes. Each of these buildings, to be most effective, must meet certain requirements of strength, space in floor area or storage cube, temperature and moisture control, convenience, lighting, etc. For these several uses and use requirements a number of agencies, including the federal government, state and academic extension agencies, and private commercial organizations are recommending a vast variety of different structures and types.

Do we want to "standardize" farm buildings? Do we not, in fact, mean that in Mr. Hoover's words we want to "simplify" them; to reduce the variety to the minimum that will meet effectively the requirements of farming practice and climatic conditions throughout the country?

As I have sensed the discussion of farm construction problems in the Structures Division of this Society, there are at least three groups involved: (1) Those in charge of agricultural school instruction or extension work, (2) the representatives of various building materials interests, and (3) those rendering construction service to the farmer incident to the sale and installation of mechanical equipment. All three groups have something to gain by simplification of farm building practice. The extension man can devote himself to refinement and to wider utilization of his product; the building materials man can furnish a better, more economical structure; the equipment man has fewer special conditions to overcome. The farmer himself gains by all three improvements.

Such an attempt at collaboration between the representative other societies has lead to endless discussion and little progress. There have been occasional evidences in my own brief observation of such a confusion of purposes in this society. But, and right here I want to make the principal point of this paper, this situation can and should be perfectly normal, and its results constructive, if the right relationship between groups is maintained.

A purely professional group stands in its relation to building materials or other trade organization interests much as a prospective builder in relation to his architect. Sentatives of public and private interests may, and in

It is the builders part to state what he wants in the way of space and accommodations; the architect tells him how to get it most effectively and economically. In the same way the farmer should tell the trade association man what he wants in the way of a building; how much floor area, unbroken span, storage space, load-bearing capacity, light, temperature control, or what not, and the trade association man should tell him how best to get these results with his material. If the American Society of Agricultural Engineers can stick to this simple principle of action, it will save trouble for every one involved.

This requires as a corollary, however, that the purely professional group know and agree on what it wants, and if I may judge from rather insufficient data, it is a long way from such agreement right now. To illustrate briefly, I am told that the open-front poultry house is recommended in different states from Alabama to Massachusetts through a wide range of climate conditions, but that the authorities in two adjacent southern states differ as to whether a closed or open-type is desirable. Still other states recommend the straw loft type, and others the closed type with roof ventilation. The floor area recommended as necessary for a sow and litter is stated to vary from 40 to 80 square feet, or 100 per cent. There is a similar though not so great variation in brooder house areas.

M. C. Betts, of the U.S.D.A. Division of Agricultural Engineering, in a paper presented last year before this Division, which seemed to me exceedingly to the point, brought out the need for much research before such questions can be authoritatively answered. It should not be necessary, however, for farm structures designers to mark time for several years until the ideal in use requirements is determined. When there is no final recourse to facts, it has been good practice in the engineering profession to utilize the best obtainable consensus of experienced men. When additional facts are obtained it may be necessary to modify the original idea. Until they are it certainly is better than general confusion.

My specific recommendation is that general descriptions of the required types of farm buildings be drawn up under the auspices of this Division, in terms of space and use requirements only; that these descriptions be circulated for review by those authorities not actively represented; that the burden of proof in recommending changes be placed to a reasonable extent on these respondents; and that the final result of such review and consequent modification be made the backbone of farm construction practice; a standard for the Portland Cement Association, the Structural Clay Tile Association, the National Lumber Manufacturers Association, and other similar institutions to "shoot at."

<sup>1</sup>Paper presented at a meeting of the Structures Division of the American Society of Agricultural Engineers, at Chicago, December, 1928.

<sup>2</sup>Chief engineer, National Lumber Manufacturers Association. Mem. A.S.A.E.

# Dairy Barns From a Manufacturing Point of View<sup>1</sup>

By H. B. White<sup>2</sup>

THE development of civilization to its present stage of enlightenment has been accomplished mainly in the north temperate zone. This advance has been due chiefly to the ability of man to overcome the severity of the winter storms by providing adequate shelter for his animals and himself. It is important to keep in mind that the more highly developed and prosperous the people, the greater the amount of dairy products they consume, hence the need of adequate shelter for dairy cows. In wooded sections the settlers located their homes beside the lakes and streams and usually built their cabins of logs and dug their stables into the hillsides. On the prairie the sod house and stable were common at first but were later replaced by the tar paper shack and the stable with a pole frame covered with slough grass. These stables were not as permanent or convenient as the settler desired. In stormy periods it was not easy to keep the animals properly supplied with food, as in most cases the hay was stacked outside where the wind and weather wasted much of it before it was brought to the animals.

In erecting shelter for animals it is desirable that proper attention be given to the plan and interior arrangement so that there may be comfort for the animals and convenience in doing the chores without undue cost.

This paper is based on a recent study by the author of dairy barns in the state of Wisconsin. It was the purpose of this study to ascertain (1) the cost per stall for dairy cows and also the cost per animal actually sheltered and (2) the comparative labor requirements in caring for dairy cows as influenced by barn arrangement.

The method of procedure was to study at least fifty barns of various arrangements and secure data as to the plan, size of stalls, gutters, mangers and alleys. The cost of the barns and the number of stalls and the number of cows sheltered give helpful information in considering barn equipment. From the barns measured several of each arrangement, such as crosswise, face in, face out with

litter alley, and face out with driveway, were studied for length of route in doing chores.

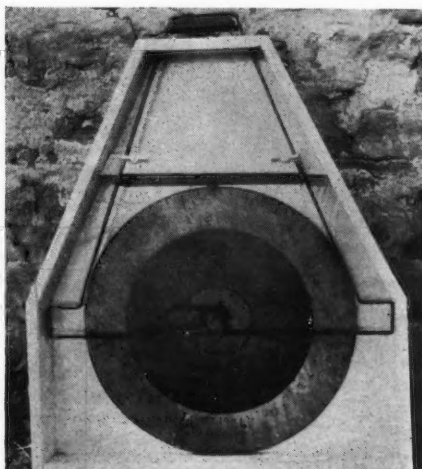
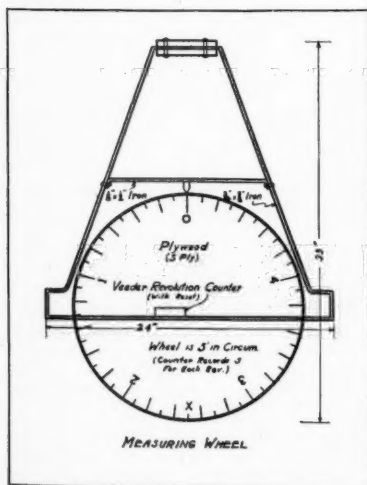
The following data was secured in the survey of 100 Wisconsin dairy farms:

## DATA FROM SURVEY OF ONE HUNDRED WISCONSIN DAIRY BARNS

Location		No.
County		
Dane		65
Jefferson		14
Iowa		6
Green		6
Dodge		3
Columbus		2
Rock		2
Waukesha		2
Age		
Average		.8 yr.
Cost		
Average of 50		\$5225.00
Kind		
General purpose		.94 per cent
Dairy		.6 per cent
Shape		
Rectangular		.92 per cent
L-shaped		5 per cent
T-shaped		3 per cent
Size		
Width, average		.34 ft.
32 were		.36 ft.
30 were		.34 ft.
21 were		.32 ft.
Length, average		.76 ft.
9 were		.80 ft.
9 were		.70 ft.
9 were		.60 ft.
7 were		.64 ft.
5 were		.88 ft.
Two-story		.99 per cent
One-story		.1 per cent
Height of ceiling average		.8 ft. 11 in.
Height of mow wall		.13 ft. 11 in.
Width of stalls, average of 77		.3 ft. 4 5/32 in.
Length of stalls, average of 77		.4 ft. 11 1/4 in.
Width of manger, average of 77		.26 1/2 in.

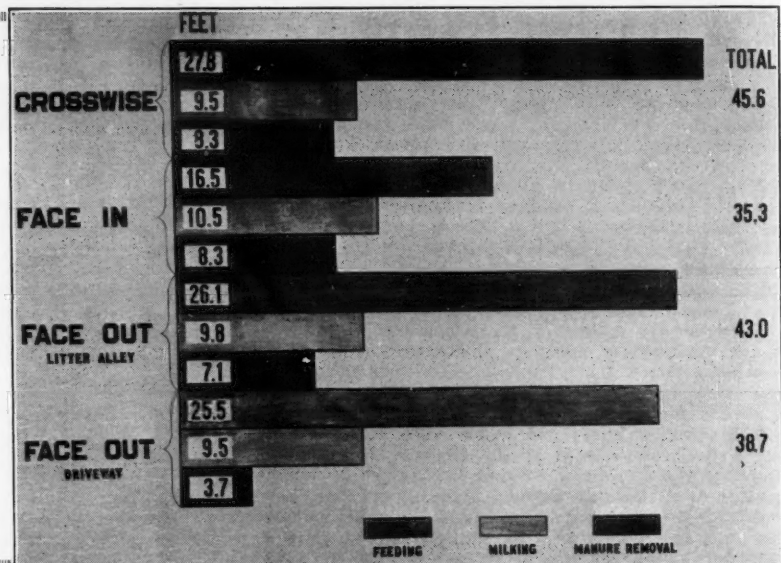
<sup>1</sup>Paper presented at a meeting of the Structures Division of the American Society of Agricultural Engineers, at Chicago, December, 1928. Journal Series Paper, No. 857, University of Minnesota, Department of Agriculture.

<sup>2</sup>Associate professor of agricultural engineering, University of Minnesota. Mem. A.S.A.E.



Two views of the measuring wheel used by Mr. White in his study of Wisconsin dairy barns, for the purpose of measuring chore routes

This graph indicates the average length of chore route for the three operations of feeding, milking and manure removal for the different arrangements of stalls. The column of figures at the extreme right of the graph indicates the totals of the average chore routes for each arrangement.



Width of gutter, average of 77 ..... 16% in.

Arrangement	Per cent
Facing out .....	70
Facing in .....	11
Crosswise (one row faced out also) .....	20
Number of cow stalls, average .....	26.8
Number of cows, average .....	22.8
Empty stalls .....	15
Cow pens .....	44
Bull pen .....	56
Calf pen (one or more) .....	78
Box stall .....	18
Stairs .....	60
Feed bin .....	9
Harness room .....	17
Driveway in mow (two are on first floor) .....	72
Silo .....	92
Drinking cups .....	67
Litter carrier .....	25
Feed carrier .....	4
Feed truck .....	18
Slings .....	4
Fork .....	98

Construction	Per cent
Floor—	
Concrete .....	98
Earth .....	1
Plank .....	1
Foundation—	
Concrete .....	53
stone .....	47
Wall—first story—	
Stone .....	40
Lumber .....	32
Concrete .....	22
Tile .....	6
Wall—second story—	
Framing—	
Timber .....	67
Plank .....	22
Balloon .....	10
Sheeting—	
Boards vertical (58 per cent with battens) .....	74
D & M vertical .....	20
Drop siding .....	5
Roof—	
Gambrel .....	68
Gable .....	25
Gothic .....	7
Roofing—	
Shingles .....	93
Steel .....	5
Asphalt shingles .....	2

Building stands—	
North and south .....	50
East and west .....	48
Northwest and southeast .....	1
Northeast and southwest .....	1

Floor area per foot of glass (average) .....	30 sq. ft.
Power line electricity .....	21 per cent
Lighting plants .....	15 per cent

Ventilation	
Outtakes installed .....	20 per cent
Intakes installed .....	30 per cent

The cost of fifty barns was given by the farmers and averaged \$5225. The average for the twenty barns in which route studies were made was \$5131.50. The cost per stall was \$199.65 and per cow sheltered at the time the survey was made \$244.35.

It is important to note that the average stalls, mangers and gutters for seventy-seven barns gave width of stalls  $3\frac{1}{2}$  feet, length approximately 5 feet, gutter  $1\frac{1}{2}$  feet, and manger  $2\frac{1}{6}$  feet. The area occupied per cow equals  $3\frac{1}{2} (5 + 2\frac{1}{6} + 1\frac{1}{2}) = 28\frac{1}{2}$  square feet. A barn 34 feet wide, which was the average for the one hundred barns, occupied by two rows of cows will have in  $3\frac{1}{2}$  feet of its length  $113\frac{1}{2}$  square feet. Two cows in this length occupy  $56\frac{1}{2}$  square feet, or just 50 per cent of the barn. This means that 50 per cent of the floor area is for convenience of the man doing chores.

The average height of ceiling for the one hundred barns was 8 feet 11 inches, or almost 9 feet ( $9 \times 112\frac{1}{2} = 1020$  cubic feet for two cows, or 510 cubic feet per cow if there are no cross alleys or empty pens). The fact that there were in the one hundred barns 15 per cent of the stalls empty shows where more attention should be given if efficiency is to be maintained.

#### CHORE ROUTES IN DAIRY BARNs

It was the purpose of this part of the study conducted by the author, not only to compare the four common arrangements of dairy barns for their efficiency in labor at chore time, but to develop a system of comparing barn plans so that the efficiency of the barn shown in the plan might be measured. A measuring wheel was made consisting of a plywood wheel five feet in circumference to which was attached by a suitable frame a Veeder revolution counter. This counter is worm driven and has a reset which makes it very convenient. The frame projects one

foot each side of center of wheel so that measurements can be taken up to walls. A map measure may be used on plans much as the measuring wheel was used in the barns. In measuring for feeding hay a ration of 12 pounds per day was fed. The six pounds per feed for each of four animals, or 24 pounds, was moved from the middle of nearest chute to middle of four stalls. The fork saved further walking as hay was distributed from this point. In case there were less than four stalls the route was to the nearest of two most distant stalls to be supplied on that trip. The hay is carried to the farthest four so that one cow alone is usually at the chute and does not require a trip.

In feeding silage a ration of 36 pounds per day was considered standard. In carrying in a basket 36 pounds was carried to two cows. The route was measured one foot from silo to middle of farthest of two stalls or to middle of one stall if there was an odd number. In feeding silage from a truck the measurement was one foot from silo to middle of farthest stall supplied by the load of silage.

Grain or feed is generally fed from a basket. A ration of eight pounds was taken as the average. At one feeding this will be 4 pounds or about 4 quarts so that a basket will hold about 32 pounds. This is enough for eight cows. The route is measured from the bin or chute to the middle of the farthest of eight stalls. If a truck is used, the route is measured from the bin or chute to the middle of the farthest stall supplied by the load.

Owing to the fact that there were different regulations in regard to the removal of the milk from the barn, and in some cases the auto was left in the driveway with cans already loaded, it was considered that there was a 10-gallon can for each six cows. It was considered that the can was located at the middle of the space occupied by the six cows. For the hand-milked cows the average route distance along the row of cows was five feet for each cow. When a double-unit milking machine was used the distance per cow was 2.2 feet, or 4.4 per trip for two cows. The cans were removed from the barn. The route was measured to the door only.

Manure was removed by four different methods. Where the rows of cows were short, the manure was pushed along the gutter with a shovel and put into the spreader just outside the door. The manure of two cows was pushed per trip. The route was measured from the farthest end of the gutter for the first two stalls and then from the farthest side of each succeeding pair of stalls for others. For the litter carrier the farthest end of the gutter for the first trip and to the door was measured for the route. Each succeeding route was from the farthest end of the trip to the door; the wheelbarrow route was the same as for the litter carrier. The manure spreader route was the total length of the gutter and to the door.

The following data was gathered in connection with the study of chore routes in twenty barns:

#### CHORE ROUTES IN TWENTY BARNs

Kind	
General purpose	17
Dairy	3
Size	
Width, average	34.2 ft.
Eight were	36 ft.
Six were	34 ft.
Two were	32 ft.
One each, 44, 30, 28 and 26 ft.	
Length, average	
Three were	73 ft.
Two were	80 ft.
Two were	92 ft.
Two were	84 ft.
Two were	72 ft.
Two were	60 ft.
One each, 96, 92, 88, 66, 58, 56, 54, and 42 ft.	
Arrangement	
Facing out with driveway	5
Facing out with litter alley only	5
Facing in	5

Rows crosswise	5
Number of cow stalls, average	28.7
Number of cows, average	24.8
Per cent of stalls filled	86.4

Cost	
Average	\$ 5131.50
Highest	10000.00
Lowest	1630.00
Per stall	199.65
Per cow	244.35

Feeding Hay (Route to middle of four stalls)	
Route, average per stall	2.2 ft.
Longest	4.3 ft.
Shortest	1.3 ft.

Feeding Silage (Route to middle of farthest of two stalls if basket is used)	
Route, average per stall	15.3 ft.
Longest	26.2 ft.
Shortest	3.8 ft.

Feeding Grain (Route to middle of farthest of eight stalls if basket is used)	
Route, average per stall	6.4 ft.
Longest	11.2 ft.
Shortest	3.0 ft.

Milking (A can at middle of six stalls. Cans taken to door of barn. For hand milking five feet per cow and for double-unit machine 2.2 feet per cow is figured to carry milk to can.)	
Route, average per stall	9.8 ft.
Longest	14.3 ft.
Shortest	3.8 ft.

Manure Removal (Where shovel only is used the farthest end of gutter for each two stalls is measured. For litter carrier and spreader the farthest end of gutter for each route. All routes end at door. For spreader total length of gutter and to door.)	
Route, average per stall	6.8 ft.
Longest	13.6 ft.
Shortest	3.5 ft.

Route Distance per Stall	
Rows crosswise, average of five	45.6 ft.
Face in, average of five	35.3 ft.
Face out, litter alley, average of five	43.0 ft.
Face out, driveway, average of five	38.7 ft.

**Feeding Hay.** The feeding of hay is not done at the rush period of the day and the farmer does not give as much attention to convenience of location of chutes for this reason. The route distance per cow of 1.3 feet for the shortest to 4.3 feet for the longest does not indicate a very great amount of travel. The variation is significant, however. The barns with cows facing out and with litter carrier have the shortest route, 1.7 feet. The crosswise arrangement had the longest route, 2.8 feet, due no doubt to placing the chutes at one side of the row and thus making it necessary to carry the hay nearly the width of the barn for some of the cows. The face-in barns are short on hay chutes because it is inconvenient to have them located in the middle of the row.

**Feeding Silage.** The advantage of feeding silage is easily in favor of the face-in arrangement. The route distance per cow of 9.6 feet is only 59 per cent of the next lowest, the driveway type.

**Feeding Grain.** The face-in arrangement again shows the lowest route distance per cow, 4.4 feet, the next closest being the face-out with driveway.

**Milking.** The route distance per cow is very uniform as far as the removal of milk from the barns is concerned. There seems to be no great difference or advantage in any type, although the distance per cow is quite high, averaging for the twenty barns, 9.8 feet.

**Manure Removal.** The barn with driveway makes by far the best showing on the route distance per cow of 3.7 feet as against the litter-carrier type with 7.0 feet.

**Barn Equipment.** The plan of the barn or its arrangement is so closely related to the equipment that can be used that it was not the intention of this study to separate them, but to record the routes as they are and suggest that further study is necessary along this line. In feeding both silage and grain the truck showed a saving in length

of route. For silage, the 13 routes with basket averaged 19.5 feet, and the seven with truck averaged 5.6 feet. Grain fed from basket in 16 barns averaged 6.8 feet per cow, while with truck four barns averaged 3.9 feet.

**Hand vs. Machine Milking.** Eleven barns where hand milking was the practice had routes of 11.1 feet per cow while nine with machines had 8.2 feet.

**Manure Removal.** The shovel method used in three barns was not the poorest judged from route distance per cow, being 9.5 feet. The wheelbarrow with 12.4 feet and the litter carrier with 6.5 feet were not as labor saving as the driveway with 3.6 feet per cow.

#### SUMMARY

The route distance per cow as shown under "Feeding"

gives the crosswise arrangement 27.7 feet, the face-in 16.5, face-out (litter alley) 26.1 and the face-out (driveway) 25.7. The milk route is 9.5 feet per cow when crosswise, 10.5 feet for face-in, 9.8 feet for face-out (litter alley), and 9.5 feet for face-out (driveway).

The greatest variation in route distance is in the manure removal. The crosswise and face-in are both 8.3 feet while the face-out (litter alley) is 7.1 feet and the face-out (driveway) is 3.7 feet. The total distance per cow for the five chores of feeding hay, silage and grain and the operation of milking and manure removal is for crosswise 45.6 feet, face-in 35.3 feet, face-out (litter alley) 43.0 feet and face-out (driveway) 38.7 feet.

A comparison of crosswise and lengthwise shows that the route distance per cow is nearly 19 per cent greater for the crosswise arrangement than for lengthwise.

## Advantages of the Trade and Grade Marking of Lumber

By Theo M. Knappen<sup>1</sup>

AGRICULTURAL engineers will doubtless welcome the news that their responsibility in so far as it applies to the selection and specification of lumber for farm construction purposes, is to be lightened considerably. This is to be done through the simple expedient of plainly identifying every grade of every species of lumber through the trade and grade-marking of all lumber made in conformity with American Lumber Standards. This will not only enable the agricultural engineer to easily and definitely specify the grades of lumber which he desires to use in farm structures, but will make the checking of such lumber when it arrives for use or is being used a far less tedious task than it has heretofore been.

Trade and grade-marking will also effectively refute the statement frequently heard that it is no longer possible to get good lumber, and thus fortify the assurance of the agricultural engineer that in specifying lumber in farm building construction he is acting for the best interests of his client. The statement that it is no longer possible to get good lumber is not supported by facts, as most agricultural engineers know from experience, for lumber is being manufactured better and more carefully graded now than was possible in times gone by. The lumber consuming public, however, is not fully participating in the benefits of better manufacture and more careful grading, for the reason that, except in limited quantity, there are no marks on lumber definitely identifying the various grades. This condition is soon to be remedied, when trade and grade-marking will become a general practice among sawmills manufacturing lumber in conformity with American Lumber Standards.

Aside from the fact that modern sawmills are equipped with better machinery operated by more skillful men than were those of the so-called "good lumber" days, more care in the manufacture and grading of lumber is made necessary through the general application of American Lumber Standards to lumber production. Those standards provide definite grades and sizes of lumber for ordinary construction purposes. They were compiled under the supervision of President Hoover while he was Secretary of the U. S. Department of Commerce for the primary purpose of instituting better manufacturing practices and better selection of specific grades and sizes of lumber for specific purposes.

By eliminating a number of grades in the various species, by making grades and sizes of all species uniform,

and by simplifying nomenclature, American Lumber Standards make the grade selection and checking of lumber less difficult than it formerly was. There is still, however, frequent occasion for argument between seller and buyer of lumber over grades of unmarked lumber, and these arguments oftentimes require expensive reinspection before settlement is finally made. In construction work that comes under the planning and supervision of agricultural engineers such arguments are doubtless numerous and require much time and tedious work that could be better expended in other directions.

The trade and grade-marking of lumber made in conformity with American Lumber Standards—and no lumber is to be trade and grade-marked unless so made—will eliminate this unnecessary work; will appreciably lighten the lumber part of the agricultural engineer's responsibility. Trade and grade-marking of lumber under the supervision of one of the great regional lumber manufacturers' associations, of which all the better mills are members, is backed by a financial guarantee as to the correctness of the marks, and this necessarily imposes unusual care in marking at the mills. The marks are applied by expert graders of long experience, upon whom rests the responsibility of not only maintaining the reputations of the mills for delivering the quality of lumber desired but of precluding the possibility of a guarantee adjustment. The marks once applied, there is no opportunity anywhere along the line of distribution from sawmill to consumer of "regrading" or of the substitution or mixing of grades. The marking makes grade identification easy of accomplishment and greatly simplifies the work of those whose duty it is to check lumber at the job in accordance with specifications. Agricultural engineers should find trade and grade-marking of lumber a valuable aid to them in the performance of their duties.

Further assurance in the specification and use of trade and grade-marked lumber will shortly be given agricultural engineers with the appearance on such lumber, alongside the regional association marks, of the national-tree symbol of financial guaranty to the dealer of whom the lumber is purchased that it is of the grade designated by the marks. The national-tree symbol is in the form of an outline of a little tree, consisting of crown and trunk, in the crown of which is imposed the letter "N". The national-tree puts the seal of quality upon lumber, and further lessens the lumber part of the agricultural engineer's responsibility in that it will assure satisfaction to his client as well as himself.

<sup>1</sup>Director of publicity, National Lumber Manufacturers Association.

# Development of Research in Farm Structures<sup>1</sup>

By Henry Giese<sup>2</sup>

**T**HIS is an age of research. At no time in history has the research worker occupied as prominent a place in the commercial and industrial life of the world as he does today. Few organizations of any importance attempt to conduct their business without the aid of research. This is not only true of the man who is manufacturing an article of merchandise but also in less tangible lines such as economics and finance. Great strides have been made in certain lines, while others have failed to keep pace.

In the field of farm structures there has been an increasing interest shown. Structures represent one of the largest single items on the farm. According to the last Iowa census, the investment in structures was \$925,598,928.00, or more than six times that of farm machinery.

Not only is this large in the aggregate but it deserves our careful attention for other reasons. When one builds a barn, he builds not for years but for generations. A mistake lives to be a handicap throughout the life of the building. Decreased efficiency in husbandry, dissatisfied help, as well as lowered production in beef, milk, eggs or whatever the products in question may be, soon overshadow any additional cost which may have been necessary to secure a well-planned structure.

When one erects a barn he buys for the most part raw or only partially fabricated materials. In a mis-conceived idea of economy he often depends, for its fabrication, upon men who are not thoroughly informed as to the requirements involved. Even if they were disposed to study the situation, to what source could they go for reliable information?

**Lack of Definite Information.** Much of what we have now is based only on traditional standards. A short time ago we asked a veterinary physiologist some questions about poultry. Upon investigation it was discovered that the information handed down in textbooks was originally reported from research done between 1840 and 1850 when

the facilities for such research were admittedly inadequate. If such information is as much in error as some of our older theories of ventilation, we can scarcely be justified in using it as the basis for present design. An English experiment reported in 1905 concludes that if the carbon dioxide content of air exceeds 30 parts in 10,000 in a poultry house the eggs produced will be sterile. Yet we find if there is any effect from this concentration it is more likely, within reasonable limits, to promote fertility. One could go on at some length to show that much of our present knowledge is inaccurate or at least inadequate. How many times have we been obliged to hedge or frankly admit a lack of knowledge when asked pertinent questions concerning the requirements of farm buildings?

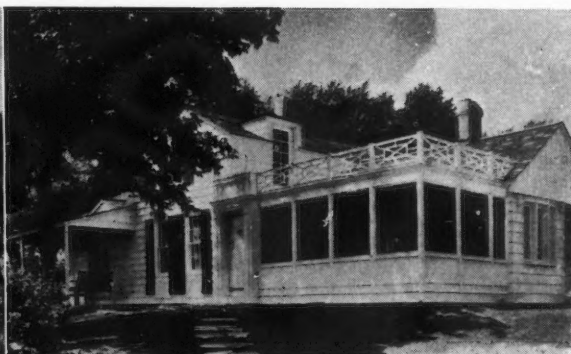
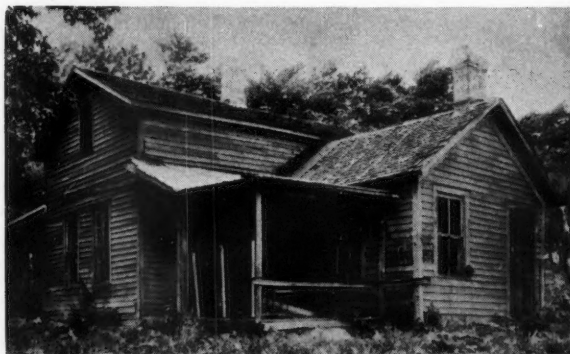
**The Present Situation.** We are about to experience a great wave of farm building activity. The farm depression has resulted in a reduction in our normal building program and the housing facilities are on the whole not up to standard. Increased activity is necessary if our animals and crops are to be properly housed.

Since farm buildings must, for the most part, be fabricated on the farm and usually without the assistance of an architect or engineer, and since the material is purchased in a raw or partially fabricated condition, it is to be expected that the bulk of farm building research must be conducted by public agencies. This will never of course be entirely true and some private organizations will add materially to our fund of knowledge rather than wait upon slow-moving public institutions. Since human nature, however, shows a decided tendency to discount private research and many manufacturers are not fully equipped to do the work themselves, we find some of the work at our public institutions subsidized by private funds.

The work in structures now in progress is both meager and scattered; most of us do not know just what others are attempting. Most of our workers carry a fairly heavy teaching or extension schedule and must sandwich a research problem in, if it is to be included at all. We are so widely separated geographically that it is difficult for us to get together and compare notes as frequently as we should.

<sup>1</sup>Paper presented at a meeting of the Structures Division of the American Society of Agricultural Engineers at Chicago, December, 1928.

<sup>2</sup>Assistant agricultural engineer, Iowa Agricultural Experiment Station. Mem. A.S.A.E.



An Object Lesson in Farm House Transformation

These two pictures illustrate a fine example of transformation. Rural America has altogether too many neglected, dejected-looking, ramshackle, rickety dwellings like that shown at the left. A great many of these can, and probably will in time, be transformed to something like the attractive, convenient, modern home at the right. Two national organizations, the American Farm Bureau Federation and the National Lumber Manufacturers Association, are cooperating in an effort to stimulate greater interest in bringing about many such transformations. This is an effort to which the agricultural engineer, in cooperation with the architect, the home economics specialist, the farm family and the building materials interests, can well afford to give a great deal of attention. Also what rural America needs, in addition to better homes—to more attractive, well-equipped, convenient and comfortable homes—is a typical rural architecture. Too much emphasis cannot be placed on the importance of this need; it should receive all possible encouragement.

**Coordination.** For some time there has been a feeling that our work should be more closely coordinated. This might be accomplished by some one person or group of persons who are vitally interested in farm structures development.

The American Society of Agricultural Engineers has had a research committee and also various committees in the Structures Division which would have liked to have been instrumental in sponsoring a cooperative program. The Research Committee has at different times given voice to its willingness and desire to assist in outlining projects or criticizing plans. Workers apparently will not seek out this source of help. Even if they should, to any appreciable extent, the committee would be greatly handicapped by lack of time as well as lack of proper understanding due largely to difficulties in transmitting ideas adequately by mail.

It is believed, though, that if we could have the assistance of one who could devote his major effort to this work and could make the contacts first hand, much could be accomplished. He would function in a national way as a county agent does with his farmer constituents. His business would be to serve as a clearing house for structures research and research workers. His sympathetic guidance would be reflected in increased interest and enthusiasm among the workers themselves. He could no doubt be of material assistance in dignifying a project and securing the support of experiment station directors.

**A Method of Approach.** Coordination can be accomplished only by centralized leadership. It is, of course, conceded that no one has authority to force such a program and that in the last analysis it is a personal proposition. The first essential is cooperation among workers in this field. We should not even request any support until we are ourselves sure that there is a great, undiscovered country in our own structures field. We must, furthermore, be sold on the idea that greatest progress can be made only through cooperation.

It has been said that we must sell research in structures as a whole to the directors of agricultural experiment stations. While there is no doubt whatever of the truth of this statement, I wonder if we should not use indirect rather than direct selling methods. If this is a personal matter, is it not necessary to sell the idea to the worker first? He must not only be sold on the idea that there is much to be done, but that he can and should be carrying his share of it. The effectiveness of his work will depend largely upon his interest and enthusiasm. I seriously question the lack of interest of executives in our program. There may be a lack of interest due to lack of information. The worker must first convince his chief that he can and will carry on. A coordinator may be of material help in furnishing ammunition and aiming the gun, but the station directors must be convinced of the capacity of the individual worker before we can expect their active support. A man who has the responsibility of designating the use of funds will naturally place them where he feels they will bring the greatest possible return. If we believe that our field offers that possibility, we must convince those who hold the purse strings.

This may require time. Short definite projects well handled will make possible the undertaking of larger and more involved ones. Often the larger problems can be attacked piecemeal and some important results obtained quickly. The coordinator must familiarize himself with state problems and analyze them to show definite needs of agriculture. He should be able to suggest projects that can be handled with available facilities and guide the project toward that end.

#### A NATIONAL PROGRAM

Undoubtedly if the work is to be effective, if these ideas are to materialize, there must be a national program and not "vaporous generalities." The importance of this is so great that it cannot and should not be made in a

day. On the other hand, it would seem that it must, of necessity, be formulated, to a certain extent at least, in harmony with the personality of the worker who is responsible for it. No two of us work or think alike. While we may be working in the same general direction, our exact methods and procedure will differ materially. The detailed plan as well as the effectiveness of the program will depend very largely upon the coordinator. Too much care cannot be exercised in his selection.

The coordinator should be a man who is nationally minded. He is the keystone of the arch. While not necessarily familiar with each section he should be able to think in terms of the nation's interest. He should be familiar and sympathetic with the agricultural situation. He should himself be thoroughly sold on research. He should be able to give it his attention over a considerable period of time. In short, he must have a vision and the determination to see it through.

**Development.** The program should grow out of rather than overthrow present activities since no one can be commissioned with definite authority and results must follow leadership. The dairyman's slogan of "grow in" rather than "go in" is surely apt in this case. It may be that the research work that is now in progress at the various stations is not in keeping with a national program. I feel that nevertheless we should encourage its completion. Morale is of paramount importance. The recognition and encouragement of the individual workers is perhaps one of our greatest considerations and merits very careful study. Success cannot be expected without their whole-hearted support.

**Personnel.** Research cannot be carried on without man power. The development of research personnel is of major importance and may be a limiting factor in the development of a program.

Men are constituted differently. Some are never satisfied unless they are experimenting with something; some do not like to delve into the unknown but prefer to apply the knowledge, gained by others, in the design of new and better equipment. Still others prefer to construct or operate. These men are all essential to the welfare of our nation but should be used where their talents will be most effective. It might indeed be quite embarrassing if a considerable number of the experiment station directors should, in recognition of this fact, authorize the employment of full-time workers in these separate lines of work. What caliber of research men could the Society offer them on short notice?

A national program must consider the personality of the individual worker as well as the local and national need. Projects should be tailor-made to suit the individual as well as the institution. He must be personally and vitally interested in it. No man will succeed in research work if he is handicapped by the absence of personal interest. Harry N. Clark, counsel on industrial morale, suggests the following to his prospective employees: Make a list of all the things you started to do within the last year and then make a list of all the things you finished. Those finished were probably the ones which were of the most interest.

**Balanced Program.** In considering the problems that are as yet unsolved and classifying them according to interest, it will be found that some are national in scope, while others are regional or local. Sometimes perhaps those of national importance have a separate regional or local application. It would seem that a properly balanced program would provide for

1. The investigation of problems of national significance by the U. S. Department of Agriculture
2. The investigation of regional and local problems, as well as the applications of the results obtained above by the various state and other agencies
3. A correlation and coordination of the program. Without any question the U. S. Department of Agriculture is the logical coordinating agency.



To meet the shelter needs of high production animals and of feed for them, and the sanitary standards of public regulation or good business practice; to make possible high standards of labor efficiency in caring for the animals; and to do this without running up building overhead costs to prohibitive figures, is one of the big problems in farm structures

This, of course, outlines an ideal to be worked toward and one which perhaps may at best, only be approximated.

**The Spectacular.** It has been said that "there are no big outstanding problems in structures research, the solution of which might bring about pronounced changes in practice accompanied by large economies." This may possibly be true, or perhaps we have only failed to recognize the big problems. Nevertheless, I believe no one will question the statement that there are a large number of somewhat smaller ones which need our attention and which will challenge the very best that any of us have to give.

Wide distribution of the farm production units and the difficulty of securing perfect coordination between the experiment station workers and the teaching and extension staffs and from them to the one who builds and uses, will always be a handicap. This handicap must not discourage us.

The savings from simplified practice and scientific management in a large factory are at once obvious and tangible. Scientific management as applied to farm structures may produce as great or greater savings and yet they would be difficult to evaluate and demonstrate. For this reason the task is not an easy one. Unfortunately we have with us a tendency to "play to the grandstand." While we must justify our efforts by results if we would convince "the powers that be" that our work is of major importance, we must keep in mind that often the most important is by no means the most spectacular.

By careful breeding and feeding we have developed high production units in our livestock. Management and housing must keep pace if largest profits are to be expected. In Iowa more than 80 per cent of the approximately 250 million bushels of corn produced is used on the farm. Even if the remainder is shipped immediately upon harvesting, this constitutes a large housing problem. In one instance, due to differences in housing, corn sold by landlord and tenant on the same day returned the landlord a net profit of ten cents per bushel above that sold by the tenant. Even if this difference were only one cent, the aggregate would be in the millions of dollars annually.

Recent observations in the housing of livestock lead me to venture to say that, when the solution is finally at hand, it will not be startling and spectacular but quite simple and commonplace.

**The Outline.** In the consideration of a program to be handled by a full-time coordinator it is quite desirable that a fairly definite plan be formulated at the outset. As the work progresses many changes may seem desirable. What should be the outline of this program? Just for the purpose of starting a discussion may I tentatively propose the following:

A survey would consider, first, the individuality and personality of the workers in the field. It is a matter of character study and will materially affect the type and distribution of the national program.

The second part of the survey would deal with the projects in progress. Judging from personal experience, "in progress" is frequently a misnomer and does not give a reliable measure of the status of a project. This survey should show the projects which are actually under way. Those which have been completed but not reported can be checked and the results made available to the Society and others interested. Those which have fallen by the wayside should be either revived or dropped.

Each one should be carefully scrutinized and a constructive evaluation made as to the probability of satisfactory completion. Will it be handicapped by an inadequate personnel? Has the institution the proper facilities for its proper conduct? What is its significance? Will its completion add to our fund of knowledge? Is the information of local or national importance? The answers will influence a decision concerning the advisability of the continuance of the project. It seems to me that a project of apparently minor importance well handled is better than procrastination, waiting for something big to show up. Isn't that also true of our national program?

It has been said that a musician cannot, as the result of sheer will power write a masterpiece. Masterpieces don't come that way. He must, of course, write. The first products of his pen may be good for nothing better than to kindle a fire, but by his activity he has placed himself

in an atmosphere of composition. As he writes, the inspirations come.

Can we sit back and wait for a great inspiration, or do inspirations come in research as in musical composition, as a result of the building up of a research atmosphere? There are numerous questions needing solution which can be handled with a minimum of equipment and expense. If financial support is insufficient for the larger ones, why not start out on the smaller ones? Who knows what the by-products will be? As one delves into the subject and scrutinizes the work of the various stations, new problems will constantly arise.

In addition to making the survey it would be a duty of the coordinator to study the needs, to express these in the form of definite projects and assemble them in a report.

It will then be necessary to make a survey of the personnel engaged in the promotion of rural structures; to compile a report of the actual progress of projects throughout the country; and to supplement this with a well-formulated list of subjects needing further investigation so stated as to make them suitable for projects. This would constitute a real accomplishment which would require the earnest cooperation of all structures men but of which the Society could well be proud.

As fine as a survey may be, however, its chief value lies in its application. It might prove very unfortunate if we were to make such a survey and then allow it to be buried in the archives. It should not be just another specimen to add to our museum but rather a working tool for future activity.

**Definite Correlation.** What we need is definite correlation: correlation between the worker and his project; cooperation perhaps with other sections, for example, on problems involving livestock or grain housing; correlation between the state and national program.

Perhaps you will say that I have hedged somewhat on the exact formulation of a national program. May I offer in defense that the foundation already exists in the now largely unrelated projects under way at the various stations. A national program must build rather than tear down; present projects must be capitalized. Would it not be inadvisable for it to take very definite form until the survey is at least partially completed?

**By-products.** Dr. Sweeney<sup>a</sup> often says that when he is working to develop a chemical product quite frequently two or three by-products are developed. I believe we will find this to be the case of a national research program. One to be expected is improved morale among our research workers. The coordinator should make a special effort to stimulate interest and enthusiasm as well as to guide progress. Enthusiasm is contagious. It will in time react favorably upon experiment station directors and will find expression in a more liberal policy toward agricultural engineering projects. This increased enthusiasm will influence the development of training facilities and the number of men qualified for structures work. The development of a searching or inquisitive attitude should have a beneficial effect upon our teaching and help keep us from getting into a rut. In brief, then, the program as proposed should consist of four major parts as follows:

1. A survey of facilities in both personnel and equipment, with a rather formal report of work accomplished, in progress and likely to be accomplished at the various stations
2. A list of subjects showing the need of further investigation, to be practically and concisely stated so that they may become the basis for project outlines
3. A coordination of the work and activities of the individual agencies into a united effort, national in scope
4. The dissemination of information, largely through citations of publication.

<sup>a</sup>Dr. O. R. Sweeney, professor of chemical engineering, Iowa State College.

## CONCLUSIONS

It is believed that there is a definite need for facts upon which to build our program of farm building design. The work at present is meager and scattered. Too much of our teaching and designing data is largely traditional and has gained prestige through age and usage. The situation demands cooperative effort and the formulation of a national program.

This is a work of such magnitude that it cannot be satisfactorily handled by a committee of the Society made up of men who, while intensely interested, could do it only during spare time. The geographical location of the stations constitutes a further handicap. It is believed that this need justifies the services of a full-time coordinator to do the job. His will be a problem of leadership since he must organize a cooperative program without definite authority. His duties will include making a survey of the present activities of the various agencies interested in farm structures, a definite coordination of these into a national farm-structures program and the proper dissemination of material to the workers.

**EDITOR'S NOTE:** In connection with the discussion of Mr. Glese's paper, the Structures Division of the American Society of Agricultural Engineers (at its meeting in Chicago, December 6, 1928) endorsed his proposal for a national coordinator of farm structures research and adopted the following resolution urging the Secretary of Agriculture to arrange for such a coordinator as a function of the Division of Agricultural Engineering:

### A Resolution Adopted at a Meeting of the Structures Division of the American Society of Agricultural Engineers Chicago, December 8, 1928

WHEREAS the investment in farm buildings constitutes a very large item of value of farm property, and

WHEREAS the research in farm structures has not kept pace with research in other lines, and

WHEREAS certain institutions and agencies have been engaged in the development of research, and

WHEREAS these institutions and agencies have recognized the importance and necessity of closer cooperation and coordination, and

WHEREAS it is felt that this coordination can be accomplished best by the Division of Agricultural Engineering of the United States Department of Agriculture, be it therefore

**RESOLVED** that The Honorable, the Secretary of Agriculture, be requested to consider the possibility of his department furnishing a research specialist whose work shall be

1. To make a survey of the research projects now under way in the various institutions and agencies interested in farm structures with a view of ascertaining.
  - (a) Status: Definiteness of purpose and extent of present development
  - (b) Probability of satisfactory completion
  - (c) Significance locally and nationally
2. To make a survey of present research facilities both as regards personnel and physical equipment
3. To prepare a comprehensive list of research projects relating to farm structures
4. To formulate a national program and stimulate and coordinate the work of the various institutions and agencies
5. To formulate a plan for the dissemination of this information.

## U.S.D.A. to Arrange for Nationwide Study of Farm Structures Research

JUST as this issue of AGRICULTURAL ENGINEERING was going to press, a letter was received at the headquarters of the American Society of Agricultural Engineers from the Hon. Arthur M. Hyde, Secretary of Agriculture, stating that the need for the studies outlined in the above resolution is clearly apparent and that the Department of Agriculture would undertake this work. The Secretary stated that he had asked the chief of the Bureau of Public Roads (in which the Division of Agricultural Engineering is located to arrange for such a study. He also welcomed in this undertaking, the support and cooperation of the agricultural engineers in the state colleges and experiment stations, of the building materials and building equipment interests, and of the American Society of Agricultural Engineers.

# Natural Draft Dairy Stable Ventilation<sup>1</sup>

By Howard W. Riley<sup>2</sup>

**I**N NEW YORK State we have expended millions of dollars to eliminate tuberculosis from our dairy herds.

The reactors are destroyed and the clean cattle returned to the barns. Not only these tested cattle but all dairy animals should be kept in barns as well suited to guard against tuberculosis as it is possible to make them. It seems safe to declare that good ventilation in a dairy stable should assist considerably in helping to keep a herd healthy. The most casual survey of our dairy districts, however, at once brings out the fact that only a very small percentage of our dairy barns are provided with well worked out ventilation systems and it is only this kind that can be counted on to provide uniformly desirable air conditions day and night in all weathers.

There seem to be two main reasons why ventilation systems are not more common; one is that they are not well enough understood and appreciated, and the other is that they often cost more than the farmer feels he can afford to pay. In this paper are offered suggestions as to possible ways of providing adequate ventilation at costs that should make it attractive to the smaller dairymen.

**The Principles of Operation.** Adequate ventilation for a dairy stable will be secured by causing an air movement through the stable sufficient for keeping the walls dry and the air sweet, the present standard for this amount being 3500 cubic feet per hour, or approximately one cubic foot per second for each 1000 pounds weight of stock housed in the stable. In the natural draft system, air movement is maintained through the agency of the heat from the cows. When heat leaves the stable it should carry with it moisture and foul odors. Since the heat of the cows is needed for moving air, the walls and ceiling of the stable must be so built as to prevent excessive loss of heat. The first step in ventilation is, therefore, to provide a warm stable.

The second step in natural draft ventilation is to pro-

<sup>1</sup>Paper presented at a meeting of the Structures Division of the American Society of Agricultural Engineers, at Chicago, December, 1928.

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<sup>3</sup>Cornell Extension Bulletin No. 151, "Dairy Stable Ventilation," by F. L. Fairbanks and A. M. Goodman, December, 1926.

vide one or more large, high, tight, warm outtake flues that start from near the floor inside the stable and lead to the open air above the roof. Cold air is dense and heavy. Cold air that presses against the outside of the stable walls, doors and windows has a pressure greater than it would have if the outside air around the barn and stable were warm and, therefore, light. The air within the outtake flues is warm and light. This warm air column, in the outtake flues, therefore, does not press backwards against the air in the stable with as much force as the cold outside air presses against the outside of the stable walls, windows and doors. In the natural draft ventilation system outside air will, therefore, of its own accord flow in through intake openings in the walls of the stable because of the difference in weight of the cold air outside the stable and the warm air in the outtake flues.

The cold incoming air will at once fall to the floor, flow toward the cows, be warmed by the body heat of the cows and expand somewhat. Thus by its entrance into the stable and by its expansion by heat the fresh air will force older stable air out through the outtake flues and this driving action is fully effective even when the outtakes start from near the floor of the stable. Since warm stable air is pushed up out of the outtakes by pressure from below there is no need of any special form of ventilator head to "draw" the air up through the flues. All that is needed at the top is a roof to keep out rain and this must guide away the rising air before its moisture is condensed.

The conditions essential for the moving of air into and out of a dairy stable by a natural draft system may, therefore, be summarized as follows: A stable well filled with stock to provide heat, walls and ceiling well insulated to conserve heat, one or more outtake flues and a number of intake passages correctly designed and wisely located. The number and location of the inlet and outlet flues will be found to be governed very largely by the question of air circulation within the stable.

**Locating the Outtake and Intake Openings.** Close observation of air movement in a ventilated stable will at once disclose the fact that air circulation there is the result of the falling of dense air in the colder parts of the stable, the rising of expanded air in the warmer parts

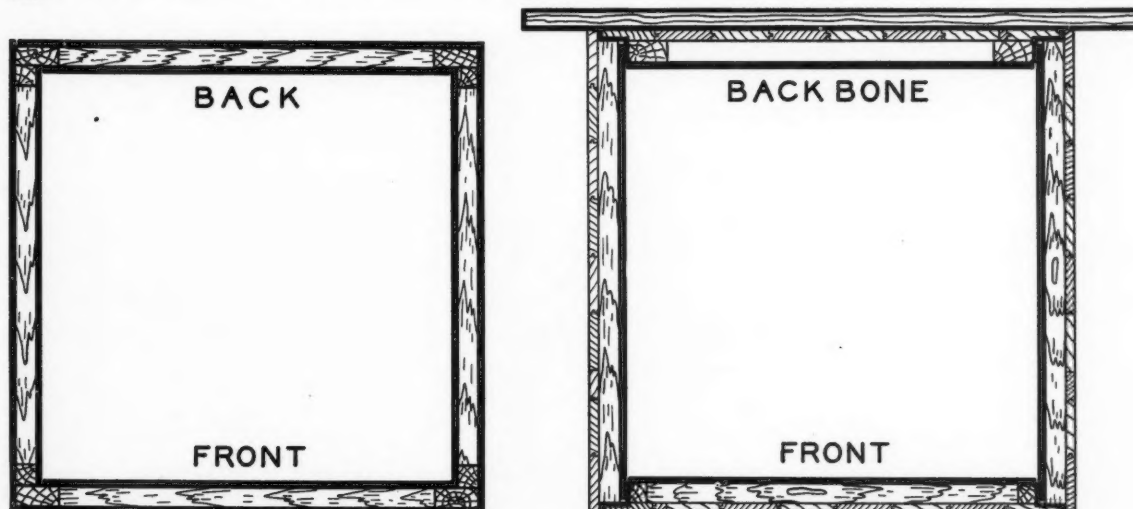


Fig. 1. (Left) The Fairbanks panel-walled flue. Fig. 2. (Right) The "backbone" type flue

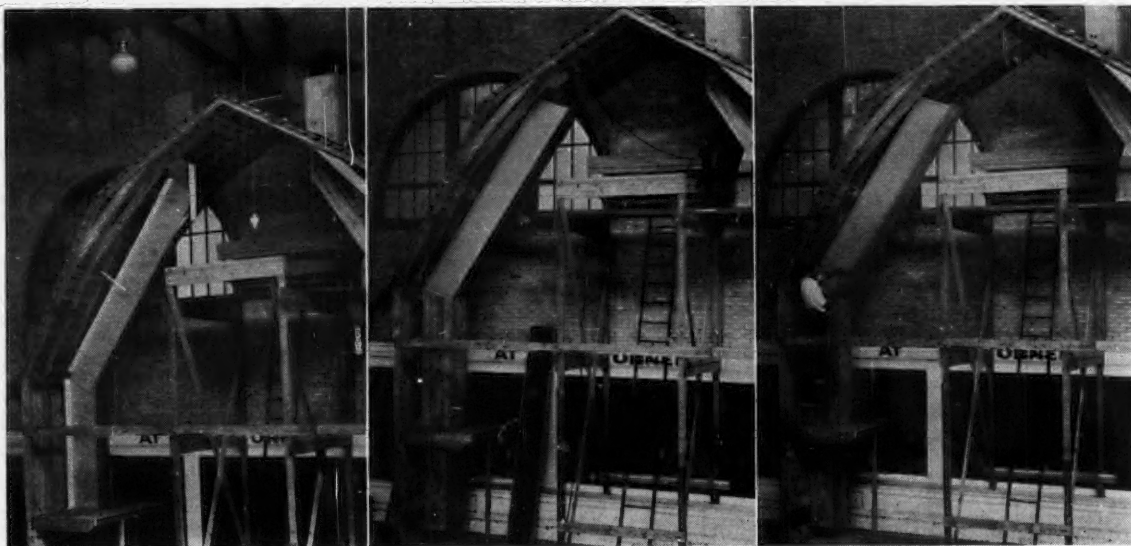


Fig. 3. (Left) Preliminary steps in backbone flue construction. Guide boards (white) are erected and sheets of insulating board tacked up, marked, and then taken down and used for making the diagram on the barn floor. (See Fig. 4.) Later the sheets are used for making "side liners" for the flue. Fig. 5. (Middle) When all the parts of the flue are ready, the backbone is first attached to the rafters by means of the back cross arms. Then the painted side liners are nailed to the edges of the backbone. The front is shown ready to go up. Fig. 6. (Right) The front is now slipped in between the side liners and they are then nailed to the edges of the front. Headers are nailed in to hold the front securely to the back and to carry the outside sheathing for the sides

of the stable and the movement of air along the stable ceiling from the warm parts to the colder parts. There will thus be a general movement from directly over the rows of cows (1) to the walls and (2) to the pen areas where relatively little heat is generated. A detailed study of the air currents near to openings into the outtake flues will show that the outgoing movement is noticeable for a surprisingly short distance, certainly less than six feet, from the flue openings. This is an important fact. It shows that the locations of the outtake flues have a completely negligible effect on the convection currents of the stable air, and from this we determine that it is not necessary to have a number of outtakes in order to insure uniform stable conditions. This means that one large flue may be used for stables of at least 50 cows capacity and probably for more. Outtake flues should be so located that the air entering them is from the warmest part of the floor of the stable; they should be so placed that they can be built as high as the barn permits and they should not obstruct the stable passages nor interfere with the handling of hay in the loft. Except for these requirements there seem to be no restrictions as to the location of outtakes.

The problem of how to design the intakes and where to locate them is, in the author's opinion, very far from being solved. It is stated by Fairbanks and Goodman<sup>2</sup> as a result of their studies of air movement by means of the Fairbanks ventilation indicator, that the intensity of the stable convection currents is much influenced by the unavoidable chilling effect of the incoming cold fresh air, and they recommend that air intakes should always be located along the outer walls of the stable regardless of whether the cows head in or head out. They also state that dampness from stagnant air pockets in pens may be avoided by placing intakes at such points. The problem of cold drafts from incoming air these writers solve quite satisfactorily by directing the incoming air stream upward against the ceiling so that it must diffuse through the warm stable air before it reaches the cows.

**A New Use for Intake Air.** It has recently occurred to the author that it might be possible to help in keeping the windows dry and the stable warm by so introducing

the incoming fresh air that it would fall in a thin sheet or blanket over the surface of windows, doors and possibly stable walls so as to keep the warm humid stable air from coming in contact with them. With such an arrangement heat from the stable would, of course, go into the incoming air, but that must occur in any event and heat so lost would be usefully expended. On the other hand, if the windows were covered within, as well as without, with cold air there would be no temperature difference and, therefore, no heat loss through the glass. Having no contact with the cold surface the stable air could not deposit moisture upon the glass, door, or wall, and they should thus be kept dry.

Hasty, incomplete, experiments have shown that if enough incoming air is properly directed over the surface of individual window panes they will be kept bone dry with an outside temperature of 5 degrees below zero (Fahrenheit). Air introduced through holes bored in the top of the sash and directed downward by a baffle materially reduced the frost on the panes of a 9-light sash and almost completely dried up the window sill. It may be that further experience will demonstrate that in place of the present arrangement of inlet passages, each of con-

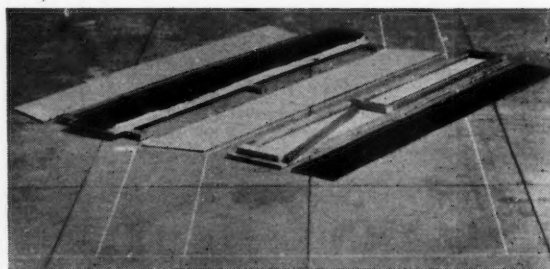


Fig. 4. Building the parts in the backbone flue construction. By means of the diagram on the floor every piece of the flue is cut to exact size ready to go up. This view shows the backbone assembled, the front nearly assembled, and the side liners ready

OUTTAKE FLUE AREAS AND SIZES																												
Height No. of head	20 feet				25 feet				30 feet				35 feet				40 feet				45 feet				50 feet			
	Area	Size		Area	Size		Area	Size		Area	Size		Area	Size		Area	Size		Area	Size		Area	Size		Area	Size		
		Rd.	Sq.		Rd.	Sq.		Rd.	Sq.		Rd.	Sq.		Rd.	Sq.		Rd.	Sq.		Rd.	Sq.		Rd.	Sq.		Rd.	Sq.	
10	510	26	24	430	24	22	370	22	20	340	21	20	310	20	19	290	19	18	270	19	18				19	18		
11	560	27	25	470	25	23	410	23	21	370	22	20	340	21	19	320	20	19	300	20	18				19	18		
12	610	28	26	510	26	24	450	24	22	410	23	20	370	22	20	350	21	20	330	21	19				19	18		
13	660	29	27	560	27	25	490	25	23	440	24	22	400	23	21	380	22	21	350	21	20				19	18		
14	710	30	28	600	28	26	520	26	24	470	25	23	440	24	22	410	23	21	380	22	21				19	18		
15	760	31	29	640	29	27	560	27	25	510	26	24	470	25	23	430	24	22	410	23	21				19	18		
16	810	32	30	680	30	28	600	28	26	540	27	25	500	25	24	460	25	23	430	24	22				19	18		
17	860	33	31	730	31	29	640	29	27	570	27	25	530	26	24	490	25	23	460	25	23				19	18		
18	920	34	32	770	31	29	670	30	27	610	28	26	560	27	25	520	26	24	490	25	23				19	18		
19	970	35	33	810	32	30	710	30	28	640	29	27	590	28	26	550	27	25	520	26	24				19	18		
20	1020	36	34	850	33	31	750	31	29	680	30	28	620	28	26	580	27	25	540	27	25				19	18		
21	1070	37	35	900	34	32	790	32	29	710	30	28	650	29	27	610	28	26	570	27	25				19	18		
22	1120	38	35	940	35	32	820	33	30	740	31	29	680	30	28	640	29	27	600	28	26				19	18		
23	1170	39	36	980	36	33	860	33	31	780	32	29	720	30	28	670	29	27	620	28	26				19	18		
24	1220	40	37	1020	36	34	900	34	32	810	32	30	750	31	29	690	30	28	650	29	27				19	18		
25	1270	40	37	1070	37	35	940	35	32	850	33	31	780	32	29	720	31	28	680	30	28				19	18		
26	1320	41	38	1110	38	35	970	36	33	880	34	31	810	32	30	750	31	29	710	30	29				19	18		
27	1370	42	39	1150	39	36	1010	36	34	910	34	32	840	33	31	780	32	30	730	31	29				19	18		
28	1420	43	40	1200	39	37	1050	37	34	950	35	33	870	34	31	810	32	30	760	31	29				19	18		
29	1470	43	40	1240	40	37	1090	37	35	980	36	33	900	34	32	840	33	31	790	32	30				19	18		
30	1520	44	41	1280	41	38	1130	38	36	1010	36	34	930	35	32	870	34	31	810	32	30				19	18		
<p>"Height" means height in feet from stall platform to ridge of roof. "No. of Head." Count 1000 pounds weight of calves as one head. "Area" means the net effective outtake area in square inches required. "Size Rd." means the diameter in inches of a single round flue for this area. "Size Sq." means the inside dimension in inches of a single square flue of an area 10% greater than the net effective area needed.</p>																												

siderable area, better results will be secured by introducing the air (1) at low velocity and in a thin sheet to avoid drafts, (2) as a blanket over the windows and walls to conserve heat, and (3) drawn from the hay mow to avoid local wind pressure effects. For this plan to be economically possible, however, the saving in necessary wall insulation must more than offset the cost of inlet ducts, and it must also provide superior stable conditions. The plan will be studied further next winter.

**Flues of Simple Construction.** The general availability of insulating lumber in large sheets makes possible the construction of homemade rectangular flues of complete effectiveness.

Two practical methods of flue construction are illustrated in Figs. 1 and 2. The first is a design adapted only to the construction of straight flues to be assembled on the ground, as in Fig. 7 and erected by a block and tackle. As shown in Fig. 1 the liner sheets are nailed to the corner panel strips and the headers nailed in at either end of each sheet. Everything is thoroughly painted with asphalt paint, and then the whole is assembled by nailing the 2x2 pieces to the two-by-fours. In the flue shown in position in Fig. 8 the outer covering is sheet insulating board painted very thoroughly. An extra protection of boards is provided at the bottom. The simple roof is protected below

by a sheet of insulating board and it has proved entirely effective in service.

The "backbone" flue illustrated in section in Fig. 2 is designed in a manner to make it particularly adapted to construction where an offset is required as shown in Fig. 3. The plan of procedure is to determine first the size of flue required and from this get the width of the strip of insulating board required for the side liners shown in Fig. 4. These are then tacked up to guide boards as in Fig. 3, the sheets are marked, taken down, laid on the barn floor in their marked relationship and a diagram constructed from which all the component parts of the flue are cut exactly to fit. The "backbone" and the front, each heavily outlined in Fig. 2 are painted, assembled and painted again all on the barn floor. They are then assembled in place as shown, making a warm, air tight, waterproof and effective flue for relatively little expense. The sheathing shown is of boards but insulating sheets could be used if preferred. Care should be taken in painting to insure durability.

The purpose of this paper is to promote the simplification of natural draft ventilation so that it may come into more general use than it is at the present time, and it is hoped that all agencies interested in this situation will attack the problem in a broad-minded way.

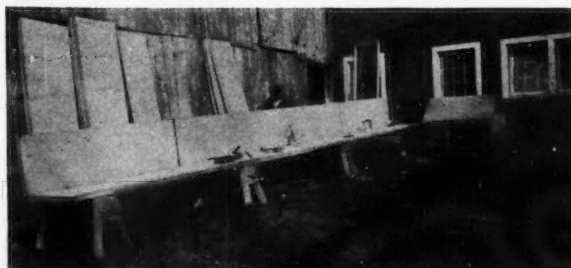


Fig. 7 (Left) The panel-walled flue under construction. The flue is completely assembled on the ground and is raised by block and tackle. Fig. 8 (Right) This shows the panel-walled flue in position on a dairy barn near Ithaca, N. Y. It is providing satisfactory ventilation

# Heat-Treated Clay Aggregates<sup>1</sup>

By T. H. Merriam<sup>2</sup>

**D**URING the war the pressing need for water transport and the shortage of ordinary ship-building materials led to the construction of concrete ships. To make such vessels seaworthy, the engineers were faced with the problem of obtaining a strong, waterproof concrete that would be as light as possible.

An effort was made to find some kind of aggregate that combined lightness in weight, strength and toughness, which when mixed with cement would yield a strong, light-weight concrete. At this time, Stephen J. Hayde, of Kansas City, patented an aggregate, the result of fifteen years research, that met these requirements. His product, called "Haydite," was a porous clinkered substance having a highly vesicular structure, made by subjecting shale or clay to high temperatures in a rotary kiln. Accordingly, eleven ships were built of this material and were successfully used until the close of the war did away with their necessity.

The aggregate continued to be used as a means of reducing the weight of structural concrete and of concrete block or tile, wherever weight is a factor in building construction. Its commercial development has been a matter of gradual growth during the ten years since the war, as the product proved its merits and as improvements in production methods have resulted in a marketable commodity. The past three years have witnessed rapid strides in its progress.

In the manufacturing process shale or clay, pit-quarried in the usual manner, is crushed to one-inch lumps which are charged into a rotary kiln. The raw material is not screened and any fines resulting from the crushing process are allowed to remain with the mass. It is not dried nor is water added, the natural moisture content of the shale as it comes from the pit being retained.

The kiln is approximately fifty feet long and four feet in inside diameter, sloping about one inch per linear foot. It rotates rather slowly, the rate of speed being regulated so that the lumps of shale will be kept rolling uniformly toward the discharge end. At the lower end two fire nozzles, burning either pulverized coal or oil, inject streams of flame into the burning chamber.

One fire nozzle, pointing up the center of the kiln brings the temperature at the charging end to about 800 degrees (Fahrenheit), which has the effect of preheating the shale and prepares it for the higher temperatures at the lower end. The preheating vitrifies thin layer on the outside of each lump, which confines the combustion gases resulting from the subsequent burning of the inner portion. When the preheated shale reaches a point about 10 feet from the discharge end, it is subjected to the direct flame from the second fire nozzle, which points down to strike the mass at that place. The rapid increase in temperature brings the shale to incipient fusion, about 2,000 degrees. The confined combustion gases are thus able to expand because of the softened outer layer, and the lumps puff out to about two and one-half times their original size. The expanded material tends to fuse into clinkers, which are dropped from the kiln and allowed to cool.

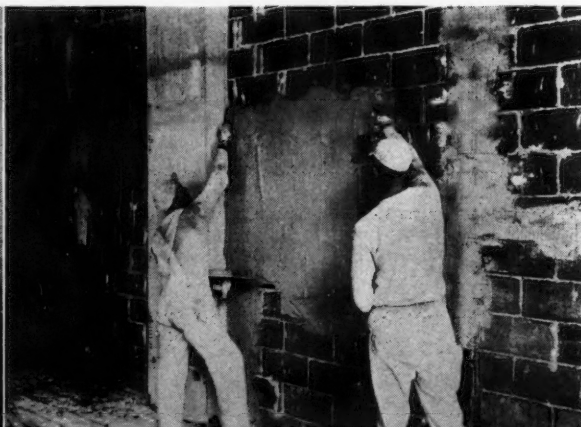
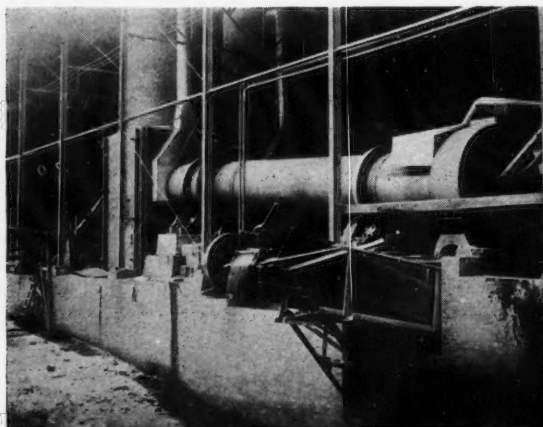
While almost any shale or clay will expand to some extent under this treatment, there is a wide difference in the amount and character of expansion obtained from various raw materials. There is a lack of exact knowledge on which to base a determination of the suitability of different shales for aggregate manufacture, but the adaptability of any given deposit may be discovered by burning a sample and noting its reaction and amount of expansion. The presence of gas-forming compounds, such as carbon and sulphur, seems to be essential for satisfactory expansion.

It is worthy of note that kiln management is a critical factor in burning a given clay or shale, as well as the material itself. Too low a temperature at the charging end of the kiln completely oxidizes the particles and produces a heavy material that does not have a vesicular structure. Conversely, too high a temperature carries it past the point of incipient fusion to complete fusion, and the material becomes viscous and flows back into a solid mass, or one in which the pores are few and large in size. An added objection to too high a temperature is the tendency to fuse large clinkers which clog up the kiln and stick to the lining.

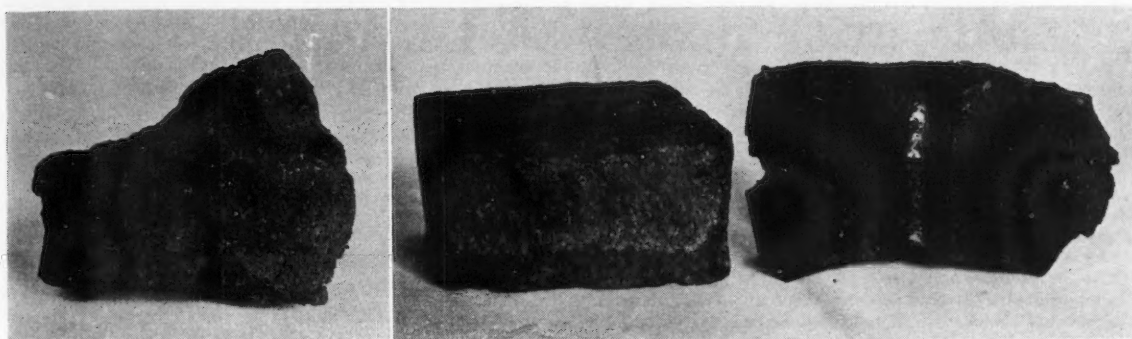
The burning process removes all combustible material from the shale. Any sulphur that may have been present is oxidized and chemical analysis of the resulting aggregate shows it to be free from sulphur content.

<sup>1</sup>Paper presented at a meeting of the Structures Division of the American Society of Agricultural Engineers, at Chicago, December, 1928.

<sup>2</sup>Cement products bureau, Portland Cement Association.



(Left) Rotary kiln of the Western Brick Co., at Danville, Ill., for heat-treating shale to produce light-weight aggregate. (Right) Plastering direct to masonry units made with heat-treated shale aggregates



(Left) Heat-treated shale clinker ready for crushing into aggregate. Note cellular structure. (Right) This illustrates the puffing action of heat-treatment on a brick. The darker outer layer on the piece at the left is the oxidized portion that confines combustion gases. At the right is the result of suddenly increasing the temperature to incipient fusion resulting in the expansion

If calcium is present in the shale, it is calcined out during the burning process and appears as quicklime in the aggregate. This must be hydrated by wetting the clinker to prevent any possible harmful effects of free lime when used in concrete. Wetting the clinker is standard practice at plants where limestone is found in the raw material, although in the absence of calcium it has been found desirable to allow the clinker to remain dry, as it crushes more easily.

The cooled clinker is crushed and screened into standard aggregate sizes. The first grade ranges from dust to 3/16 inch, the medium from 3/16 to 1/2 inch and the coarse from 1/2 to 3/4 inch. The fine and medium grades are used for concrete block manufacture while all three sizes are used in structural concrete. The different grades are shipped and stored separately until mixed with cement at the time of making concrete, in order to prevent segregation of coarse and fine particles in shipping and in storage bins.

Manufacturing plants using this process are operated at East St. Louis, Ill., Danville, Ill., Cleveland, Ohio, Kansas City, Mo., Buffalo, N. Y., and Toronto and Montreal, Canada. Plans are under way for the erection of a plant at Pittsburgh. These plants supply the aggregate for structural concrete and for the manufacture of concrete masonry units to users in their adjacent territory.

Another process of heat-treating shale for producing light weight aggregates has been patented by F. A. Glass, a mining engineer. This is an adaptation of sintering as used in the metallurgical industry for reclaiming blast furnace flue dust. Fine particles of ore are blown out of the blast furnace into the stack, and in order to agglomerate them into lumps that are of sufficient size to remain in the smelter, the dust particles are collected and partially fused by the sintering process.

When this method is applied to clay or shale, the raw material is ground to 1/8-inch particles and intimately mixed with granulated coal and sufficient moisture to form a crumbly mass. The mixture is placed on a series of moving grates in an even layer about six inches thick. An igniting flame is directed downward to strike the top surface of the layer as the grates move under the flame, which starts combustion of the intermingled coal. The burning is continued by passing the grates over a strong down draft, drawing the combustion through the mass. The burning process may be compared to smoking a cigar, in which the lighted match is analogous to the igniting flame and the suction of the smoker corresponds to the down draft.

The grates continue to move over the draft until all combustible material is consumed, at which point the clinkered shale is discharged, cooled, crushed, and graded into aggregate. In appearance the material resembles the product of the rotary kiln process and tests on laboratory

specimens of concrete made with this aggregate indicate satisfactory performance.

Mr. Glass calls his product "Lytag." He claims considerable economy and rapid production by sintering and is arranging for a commercial plant in the east to be in operation in a few months.

Concrete made from heat-treated clay aggregates falls into two distinct classes—monolithic or structural concrete cast in place and precast masonry units. The reason for this distinction lies in the fact that the monolithic concrete is a dense, water-proof material having all the characteristics of standard concrete except its weight, while the masonry units are porous and, in addition to being light in weight, are sound and heat insulating and nailable.

Monolithic concrete of a desired compressive strength can be made with this material that will weigh approximately one-third less than when made with sand and gravel or stone. For example, if concrete made with standard aggregates, having a compressive strength at 28 days of 3000 pounds per square inch, weighs 150 pounds per cubic foot, concrete made with heat-treated clay aggregates, having the same compressive strength, would weigh approximately 100 pounds per cubic foot.

In designing the mix, allowance must be made for the high moisture absorption of the aggregates, resulting from their vesicular structure. It is common practice to saturate the aggregates before mixing with cement. The following figures, based on tests made for the manufacturers by recognized testing laboratories, indicate weights and compressive strengths of representative proportions of light weight concrete:

Mix: cement, fine aggr., coarse aggr.	Weight of concrete, lb. per cu. ft.	Compressive strength at 28 days, lb. per sq. in.
1-1-2	106	3890
1-1½-3	101	2873
1-2-2	102	2730
1-2-3½	100	2465
1-2-4	98	2345

The values for bond and shear are the same as for ordinary concrete. The modulus of elasticity (E) ranges from 1,500,000 to 2,000,000, which is somewhat lower than that of standard concrete, the latter ranging from 2,000,000 to 3,000,000. The coefficient of expansion is 0.0000055, the same as for standard concrete.

As will be noted from the above figures, slightly

larger proportions of cement are required with these aggregates to obtain concrete of the same strength as when sand and pebbles are used.

Field procedure in the use of these aggregates follows standard methods except that experience is required on the part of the operators to adjust themselves to the unusual qualities of the material. One item that is markedly different is the tendency of the larger pieces to float, precisely the reverse of ordinary aggregates. When rather wet consistencies are employed to permit chuting, consideration must be given to this fact. Furthermore, as in the case of other harsh aggregates, somewhat longer mixing time is desirable for best results.

The practical application of the light-weight feature is made in the erection of multiple-story structures for reducing the dead load of concrete in floors and in fire-proofing structural steel. Lessening the dead load approximately one-third in this manner permits such buildings to be designed for considerable economy in materials for columns and foundations.

In making precast masonry units a rather dry mix is used having a consistency to permit immediate removal from the mold after tamping. Hence, the cellular nature of the aggregates and the semi-plastic mix results in a concrete block having an extremely porous structure, which gives such units their sound and heat-insulating qualities and further reduces their weight.

An 8x8x16-inch concrete block having 40 per cent air space made with heat-treated clay aggregates weighs 26 pounds and meets the standard specifications of the American Concrete Institute and the Hoover Building Code of 700 pounds compressive strength per square inch gross area at 28 days.

In 1927 the Underwriters Laboratories made complete fire tests on wall panels built of these hollow units, eight inches thick, resulting in their classification as a three-hour fire retardant in load-bearing or non-load-bearing walls with incombustible members framed in. Performance under the fire tests made them eligible to certification under the inspection service of the Underwriters Laboratories.

Tests by G. F. Gebhardt, of Armour Institute of Technology, on the thermal conductivity of such units show that the coefficient of conductivity is 1.62 B.t.u. per degree Fahrenheit per hour, per inch thickness, per square foot of surface area, or 38.9 per day. The coefficient of monolithic concrete is 6.0.

The porous concrete resulting from the cellular structure of the aggregate and the method of manufacturing tends to prevent the passage of capillary moisture through the units. The heat insulation and freedom from moisture makes it practical to plaster direct to masonry walls without furring and lathing. This type of construction has been followed in a number of residence and apartment buildings with satisfactory results.

Tests by Paul E. Sabine of the Riverbank Laboratories on sound transmission indicate that these units have an average reduction of 38 sensation units in the intensity of sound passing through a four-inch partition wall. This laboratory is the authority for the statement that a similar wall constructed of wood studs and wood lath, plastered on both surfaces, has a reduction of 28 sensation units.

Nails may be driven into these block and will hold so that wood trim may be nailed directly to the masonry without the use of nailing strips or plugs. It is also possible to cut and channel such walls freely without chipping or cracking, so that plumbing and electrical installations may be readily made.

The delivered cost of the units in localities where they are available averages from one to four cents more per block than for the ordinary concrete product.

In conclusion, it seems that heat-treated clay aggregates have opened a wide field in engineering design with reference to the reduction of weight of concrete of satisfactory strengths. Weight reduction in firesafe building materials has challenged the attention of manufacturers in all lines of the building industry, and the development of this particular product is being closely followed by those engaged in the structural field.

## Research Reduces Fire Hazards from Static Electricity on Belts

**R**ELATIVE safety from dangerous explosions and such fires as are often ignited by static electricity, when it is generated by the moving belts of machines, may be assured as the result of research work carried on in the laboratories of the U. S. Department of Agriculture by P. W. Edwards and J. O. Reed of the Bureau of Chemistry and Soils.

Static electricity is generated on a moving belt, and the voltage may sometimes be considerable. One of the belts used in the experimental tests of the new method registered a potential of 40,000 volts. The charges may be built by one or all of three methods: (1) Friction of the belt on the pulley, (2) the separation of the belt from the pulley, and (3) by friction of the atmosphere on the belt. The principal source of friction under normal operating conditions, according to the engineers, is the separation of the belt from the pulley. Whenever two dissimilar materials that have been in contact are separated, a static charge is produced on each object, under certain conditions. In the case of a belt there is a continual separation, and charges are generated on the belt and on the pulley. The pulley is commonly a conductor of electricity and if the machine is grounded the charge will not remain. The belt, however, is usually a non-conductor, and the potential may under some circumstances build up until sparking occurs. If explosive or inflammable gas or dust is present explosion or fire may follow. Several methods of removing this electrical charge have been devised, but without entirely satisfactory results.

In the recent experiments, Mr. Edwards and Mr. Reed worked with the assumption that a metallic belt would eliminate the trouble because it would be a conductor of the electrical charge and this would prevent the formation of the electrostatic charges or would neutralize them as rapidly as they were formed. A metallic belt is not feasible, so they endeavored to find a method of making a rubber or leather belt a conductor of electricity. They sought a material which could be applied to the belt and which would have sufficient electrical conductivity to remove or neutralize static charges as rapidly as they are formed. After many trials they found that, if a conducting powder such as aluminum, bronze or copper were added to a good grade of spar varnish used to hold the powder on the belt, the conduction of rubber belts would be adequate. Lamp black, which is finely divided carbon proved to be the most practical conducting dust, and spar varnish, the thinner of which consists of a mixture of mineral spirits and carbon tetrachlorate, gave a preparation which would not flame and cause a fire risk. This has proved to be a satisfactory non-static dressing for rubber belts, but not for leather.

A dressing for leather belts consisting of liquid fish glue, glycerine, sulphonated castor oil, water, lamp black, and ammonium hydroxide has considerable merit, the engineers say, and it can be applied while the belt is moving. If the belt has not been well cared for before the non-static dressing is applied, it may cause the belt to stretch, and several applications may be required before the belt will give entirely satisfactory service.

# Evolution of the American Farm House<sup>1</sup>

By Rexford Newcomb<sup>2</sup>

THE evolution of the farm house in America so far as its outward aspects are concerned, does not differ very widely from that of the urban residence. However, some of the most fascinating and beautiful pieces of residential architecture in this country have been farm houses.

I am going to push back the horizon of farm architecture to the time when the Pilgrims had just landed upon the rockbound coast of New England. I want to point out that they did not settle in log cabins as we are told in our history textbooks. The earliest of our farm houses were simply palisade huts of logs set vertically in the ground. To be sure that type of house was utilized only by the very earliest settlers and through only one or two short winters. We have, moreover, very definite documentary evidence that these palisades were often extended from the house to enclose a garden, so that they served at once as the wall of the house and as the garden enclosure.

When our colonists came to the Atlantic seaboard, rural England had not as yet embarked upon the revival of classic architecture that had already set in at London and the larger centers. The rural districts still used the old medieval types of structure, and most of our colonists came from the rural districts where wood was still plentiful, and the buildings were of the half-timber type. The frame of such a structure was assembled upon the ground and then raised into place and pinned together with heavy wooden pins. The in-filling or wall material was often of wattle-and-daub, made of straw and clay rolled into

"cats." This rough work was plastered with clay, white-washed inside and covered upon the exterior by a thin coating of lime plaster. Sometimes the in-filling consisted of sun-dried brick or burned brick, which was stuccoed outside and plastered within.

Our colonists were thoroughly conversant with this type of structure, and they could not immediately evolve something new. The result was that the earliest of the worthy houses of New England were built upon the half-timber principle. But they found that the wattle-and-daub and other such material as had been used to fill in the frame in the old English houses would not do in so rigorous a climate as that of New England. Therefore, they began to rive, split, or saw out a covering. These clapboards, as we call them, when once tried were found to be so efficient at shedding water and at keeping out the wind that they were universally adopted, and became an important feature of the New England exterior. The clapboarding comes right down to our day, in what we call siding or weather boarding.

There was not a great difference between the early New England farm house and the village dwelling. The plan shown in Fig. 1 is typical of the class. Here the heavy corner posts support girts and summer beams, which in turn carry the joists of the second floor. Here, it will be noted, the chimney goes up through the center of the structure, the fireplaces opening thereto. This arrangement conserved heat and stiffened the structure. The hall was the place of all work, and was not the hall of which we now speak. If there was a feature of this sort, it is that portion of the plan designated as the porch, which in fact was really a little entrance vestibule from which the winding stairs ascended.

The exterior of such a house (Fig. 2) was rather bleak and bare, but foursquare and staunch. The earliest windows in New England were made of parchment, but presently the casement sash, glazed with leaded glass in diamond panes, made its appearance. This was in time replaced by the double-hung window as shown in this house (Fig. 2). As will be noted, there is as yet little in the way of ornament, but the house through its staunch and thorough honesty and its splendid proportions makes a good appearance.

The next evolution in plan had to do with the kitchen utilities. The kitchen was separated and placed in a lean-to which was added at the rear of the house (Fig. 3). A fireplace was provided for it and an oven constructed. Access to the cellar was frequently had through a trap door in the floor of this lean-to. The lean-to remained a frank addition for only a short time, however, for soon the main roof was extended down to cover it in such a way that it became an integral part of the structure.

Soon the upper floor began to project out over the lower walls (Fig. 4). By this scheme a bit of room could be obtained in the bedrooms and protection was afforded the lower walls, but the reason for this feature is probably to be sought in precedent in old England rather than in necessity in the colonies. In other words, the old English types were still in the minds of the colonists. However unadorned this house may appear, it is beautiful in the way that it meets the housing problem of its day and time.

But let us enter one of these old houses. Here one finds deep-throated fireplaces with cranes, pots and kettles, and the spinning wheel. Here one sees straight-back chairs with rush bottoms and gate-leg tables. Around the walls hang the various homely household implements, and these were many, for the farm in those days was in a

<sup>1</sup>Paper presented at a meeting of the Structures Division of the American Society of Agricultural Engineers, at Chicago, December, 1927.

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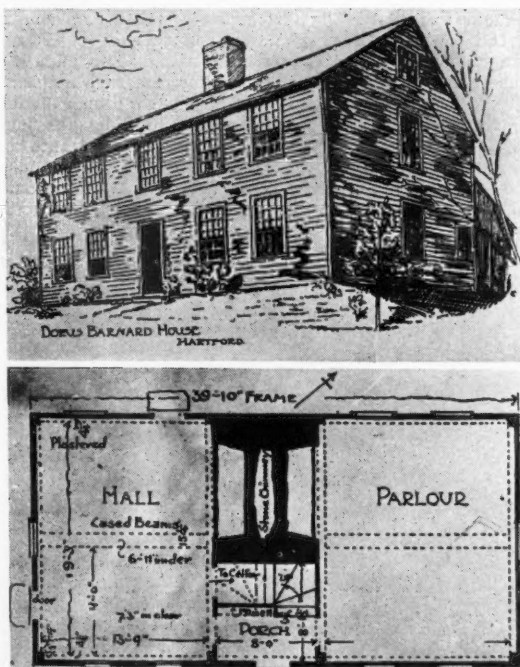


Fig. 1. (Below) Plan of Dorus Barnard house. Fig. 2. (Above) Dorus Barnard house at Hartford, Connecticut

sense a primitive manufacturing plant, providing everything the people ate and wore.

The earlier interiors were plain boarded but as time progresses we find plastered partitions with wood trim around openings. Finally the walls are panelled to the ceiling. The early doors, likewise, were of the batten type, but presently the panelled door, prototype of the modern American panelled door, makes its appearance. These interesting old interiors of the early Americans are great human documents and tell a complete story of the life of that far-gone day.

In the late Colonial or Georgian period, plaster was used upon both walls and ceilings, and the more prosperous land-owners could now afford to purchase the imported panoramic papers brought to New England by our venturesome traders of Salem, Portsmouth, Marblehead and Boston. These lovely papers lend a larger measure of color than had heretofore invaded the American interior.

Presently the exterior of the early farm home was somewhat modified. This was occasioned by a change of the roof, which, in the early period, was very steep, but which now was transformed into the two-plane slope which we know as the gambrel roof. This change permitted greater space in the attic, which now in effect became a third living floor and was dedicated principally to the use of servants, black and white.

About the same time a fundamental change appeared in the plan of the house. A central hall or corridor was projected through the center of the mass, the rooms flanking it on either side. A stairway more or less elaborate now led to the upper stories from this hall, while the fireplaces and their respective chimneys were relegated to the ends of the house. With this sedate symmetry of plan came also a gradual infiltration of classic details and proportions. These borrowed from England had in reality been imported to England from Italy, largely through the efforts of Inigo Jones and his successors like Wren, Hawksmoor and Gibbs. Synchronizing with the reigns of the Georges, these balanced, classically inclined houses are known as Georgian, and are thus distinguished from the plainer, bleak types which we call Early American. Both species are members of the larger family called the Colonial.

As one proceeds down the Atlantic Coast, he notes in the architecture a distinct variation from that of New England. Here the effects of a changed economic and social system are plainly read in the types which so adequately adapt themselves to life on the great plantations where cotton and tobacco were raised, and where large numbers of black men were the property of white owners and available for running up and down and doing the hard work.

With such a social scheme the plans become extremely extended and detached. It made little difference how far the kitchen was from breakfast room or dining room, for there were plenty of black mamies to take the steps and covered dishes to keep the food warm. Usually the

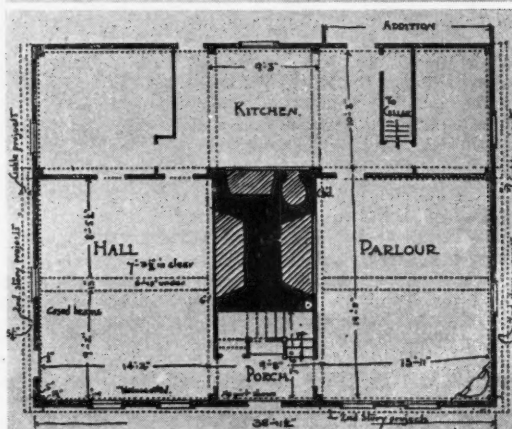
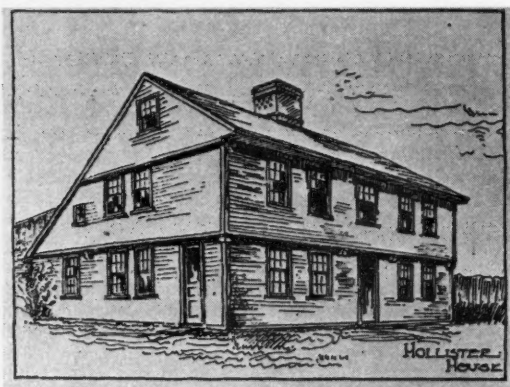


Fig. 3. (Below) Plan of Hollister house. Fig. 4. (Above) Hollister house at South Glastonbury, Connecticut

kitchens were in a wing far removed from the apartments of the master's family, and often upon a lower level with a short flight of steps intervening. The plantation house plans of Maryland (Fig. 5) illustrate such a scheme. Here we find a central mass, the house proper flanked by two wings connected by corridors to the main house (Fig. 6). One wing was for kitchens and servants and the other for the office of the estate. Here the dusky laborers appeared for orders and here the estate accounts were kept. This feature was analogous to the office often included in the modern farm house of today.

Of the openness of climate enjoyed in the South, we should expect to see a reflection in the architecture. This is realized in extended plans, larger openings, and open two-storied porticoes. Fig. 7 which very well expresses these features, is the old Carroll mansion, Homewood, now on the campus of Johns Hopkins University in Balti-



Fig. 6. (Left) The White house, Anne Arundel County, Maryland. Fig. 7. (Right) "Homewood," Baltimore, Maryland



Fig. 9 (Left) Rear of Mt. Vernon showing arcade joining service wing. Fig. 10. (Right) Mt. Vernon, Virginia. (Photos by author)

more. It was a farmhouse and, in my estimation, one of the handsomest structures ever erected in America. The combination of red brick, green shutters and white exterior trim is one that cannot be surpassed for rural situations and this example, alike lovely in form and color, is supreme in its class.

In Virginia we find the plan still more open and detached, and in some cases the kitchens and service appointments completely separated from the main house (Fig. 8a). Mount Vernon, long the home of General Washington, is a good example of such usage. Note how in our plan (Fig. 8b) the kitchen on one hand and the servants

quarters upon the other are completely separated from the main house except for the curved open arcade that extends between them (Fig. 9). Fancy the labor involved when the General and Mrs. Washington entertained at dinner. Note on the plan the large proportion of the house given over to social purposes, also how the various utilitarian structures distribute themselves right or left along the minor axis of the estate.

Mount Vernon is constructed of wood, but that wood simulates stone. While this is not entirely a commendable procedure, the forms are so charming, so eloquent of the climate and social scheme behind them, that the whole becomes a valuable document and commentary upon the life that it housed, say nothing of its precious historical associations (Fig. 10).

The Middle West was settled from two sources. Ohio, Michigan, Illinois, Indiana and Wisconsin were peopled largely by New Englanders, while Kentucky, Tennessee and the South were recruited from Virginia and the South Atlantic seaboard. Each of these peoples brought with them notions as to what the farm house should be, these notions predicated upon what they had known in the East. Thus we have in the north central West a transplanted New England spirit, and in the South a transplanted Virginian character. In the Ohio houses of the early period one notes the same plan that we have encountered in the Early American type of New England (Fig. 11), a central chimney stack, the same porch with dancing steps, the same bleak, weather-boarded exterior. But the demands made by life in this quarter modified the plan, and here we see the addition of a summer kitchen with the intervening recessed porch which is somewhat southern in expression, a concession, I presume, to the Ohio climate.

While the earlier houses in Michigan, northern Indiana, Illinois, and Ohio begin in what may be termed an Early American style, by 1830 the Greek revival which in the East was making great strides, descended upon the Middle West and the earlier types gave way to temple-like houses adorned by all manner of Greek ornament.

I think that perhaps the state of Kentucky offers as

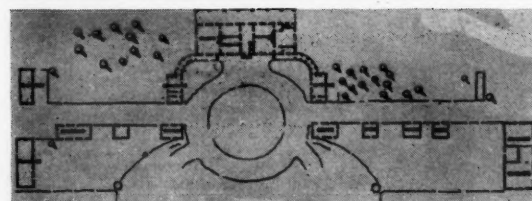
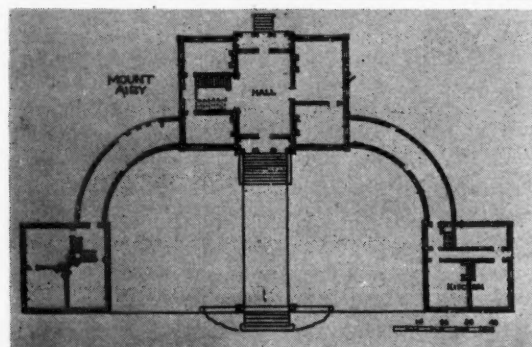
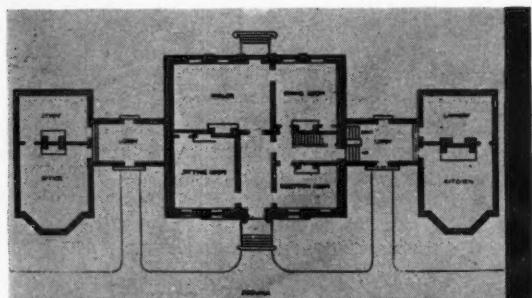


Fig. 5. (Above) Plan of Harwood house, Annapolis, Maryland. Fig. 8a. (Middle) Plan of Mt. Airy, Virginia. Fig. 8b. (Below) Plan of Mt. Vernon, Virginia.

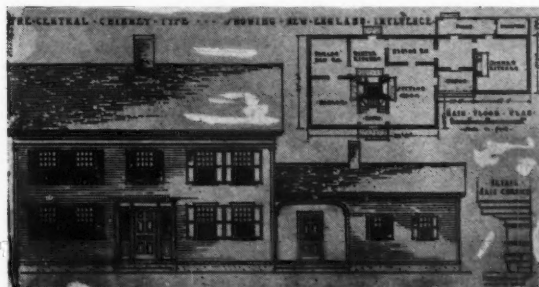


Fig. 11. The Carpenter house near North Olmstead, Ohio



Fig. 12. (Left) Old clapboard covered log farm house, Mercer County, Kentucky. Fig. 13. (Right) The old Du Puy farm house, Woodford County, Kentucky (Photos by author)

interesting an opportunity to study the evolution of the farm house as is found in the Middle West. Starting with the log cabin of horizontal logs with one or two rooms, these houses by adding appendages often became of considerable extent. Often the settler orientated his house so as to capitalize upon the prevailing breeze in summer. He would then construct a dog-trot porch connecting the kitchen with the main house, and this porch made an admirable lounging place during the heated days of the year. Many a staunch old cabin like the Creel Cabin on that farm in Hardin County upon which Abraham Lincoln was born, stands to this day to testify to the homely creature comforts such a structure can supply.

The next step in Kentucky came with the construction of squared-log structures which in turn were covered with clapboarding. Frequently a genteel elegance was attained by the addition of a two-storied portico at the front (Fig. 12). Note the staunch stone chimneys and the sweep of the roof down over the lean-to at the rear.

Eventually the farmer turned to the more permanent materials and in Kentucky particularly many houses of stone were constructed. The early smaller stone houses in time became tenant houses or slave quarters, while the plantation owner built for himself a larger stone residence (Fig. 13), or erected a brick mansion so many of which dot the countryside in the blue grass country of Kentucky (Fig. 14).

One of the most delightful features of any countryside, it seems to me, is the fence, and Kentucky has some delightful fences. The old rail fences are full of human interest, but for sheer beauty and rural atmosphere the lovely stone fences which line the roads for miles in the blue grass state, excel all other types of enclosure (Fig. 15).

The minor farm buildings of Kentucky, likewise, prove to be full of interest. Smoke houses, barns, ice houses, and other structures built of stone or brick are of great beauty as well as eminently utilitarian. The ice houses

are particularly picturesque (Fig. 16). The structure consisted usually of a circular masonry cistern-like structure below ground. This, approached by stone steps like the

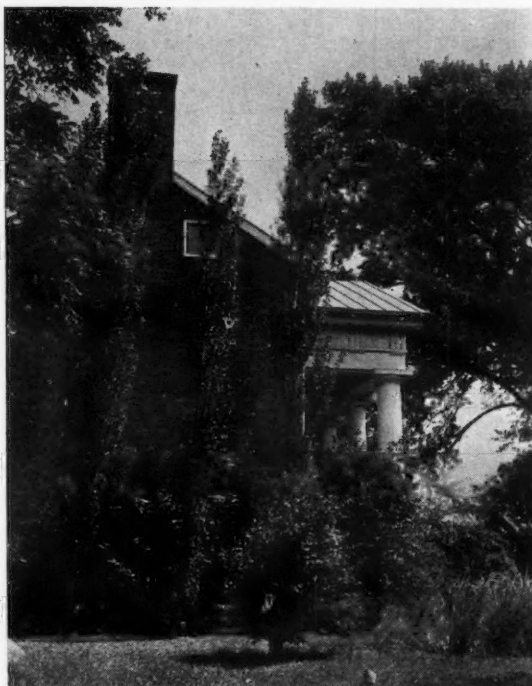


Fig. 14. A picturesque farm house near Danville, Kentucky

Fig. 15. (Extreme right) A bit of stone farm fence in the blue grass section of Kentucky. Fig. 16. (Right) Old Kentucky ice house in Mercer County. (Photos by author)





Fig. 18. The Libby stables at Ojai, California. Wallace Neff, architect. Awarded certificate of honor by the American Institute of Architects

old-fashioned cellar, was crowned by a high conical roof. On the larger estates a battery of these stone houses, sometimes intercommunicating below ground, were erected. Certainly the artistic handling of such a structure could offer the modern silo builder many suggestions, while the present day builder in general could learn a good deal about form and line in architecture from these practical structures (Fig. 17). For that matter, there is a wealth of knowledge along this line to be gained by a study of the older farm buildings of our country, which, while not as sanitary or as practical as our present-day buildings, at least have some measure of beauty and are not therefore eyesores in otherwise beautiful landscapes.

But some excellent modern farm architecture has been achieved in America and at least one eminent architect has given considerable attention to the study of farm buildings. This is Alfred Hopkins, of New York City, who, while solving the utilitarian problems of his clients, does not forget to keep an eye upon the beauty of arrangement, mass and line. His work is therefore eminently beautiful in every respect.

But Mr. Hopkins is not the only architect who has turned his attention to so prosaic a problem as the design of a cow barn, and in Fig. 18 I show the barns of Mr. Libby at Ojai, Calif. I know very little about farm barns, but the assurance of the farm manager is that the Libby barn is eminently practical. I know that it is strikingly beautiful. Of course, this structure is in California, and it has an openness that would not be tolerated by a rigorous eastern winter. It was constructed of concrete and common brick—simple materials—but a delightful interest attaches to it because it is something more than just a utilitarian cow barn. It is a work of art—a thing of beauty and a joy forever. And this any cow barn or corn crib or silo may be also, if its good and simple structural materials are but disposed

in beautiful relationships. Distinction—beauty—does not attach to the object as such; it attaches to the form in which it is expressed.

Now I know that everyone who has been raised on a farm has a particular affection for that special bit of sod, and many ramble back periodically to the "end of the road" to live over again the experiences and recall the associations that have made life dear upon the "old home place" (Fig. 19). But how much finer and more comfortable may be those same farm houses today! With good plumbing, efficient heating plants, electric lights, radio, the automobile, good roads, and other like advantages, it is strange that people gravitate to the city as they do. Perhaps a large part of the solution of making farm life more attractive lies in this very problem of making the farm home and all farm buildings beautiful as well as efficient. Certainly the love that attaches to the "old home place" would be heightened if that home were beautiful in mass and line and color. There is no reason why American farm architecture of our day should not be as beautiful as it once was. I am convinced that farm life would be more attractive if it were!

## Waste Utilization

IT HAS been pointed out that the successful establishment of a pulp and paper industry using agricultural waste as its raw materials means: (1) The stopping of overdrift on the world's forest resources; (2) automatic flood control by arresting the destruction of forests at the headwaters of streams; (3) creation of new sources of income for agriculture from by-products now wasted; (4) building of pulp and paper mills where they have never been built before, that is, wherever corn is grown abundantly and there is ample water supply for manufacturing.



Fig. 17. (Left) Outbuildings at "Ashland," home of Henry Clay, Lexington, Kentucky. Fig. 19. (Extreme left) The "Old Home Place" at the end of the road. (Photos by author)

# Agricultural Engineering Digest

A review of current literature on agricultural engineering by R. W. Trullinger, specialist in agricultural engineering, Office of Experiment Stations, U. S. Department of Agriculture. Requests for copies of publications abstracted should be addressed direct to the publisher.

**Terracing in Oklahoma.** G. E. Martin (Oklahoma Agricultural College (Stillwater) Extension Circular 218, rev. (1928), pp. 23, figs. 14).—This circular points out the benefits of terracing to landowners and operators, and describes a method of terracing whereby it is thought these benefits may be secured.

**Household Refrigeration:** A partial list of references, compiled by S. C. Clark, M. B. Porter, and L. W. Reynolds (U. S. Department of Agriculture, Bureau of Home Economics, Home Economic Bibliography 5 (1928), pp. 24).—This is a partial list of references on household refrigeration restricted to articles and publications in English, nearly all of which were published in this country.

**Quality of the Surface Waters of New Jersey.** W. D. Collins and C. S. Howard (U. S. Geol. Survey (Washington, D. C.) Water-Supply Paper 596-E (1927), pp. IV + 89-119 pl. 1, figs. 2).—The results of an investigation of the quality of the surface waters of New Jersey are reported and discussed. The results indicate that where unpolluted these waters are generally clear and contain only moderate quantities of dissolved mineral constituents. The waters in the southern part of the State are softer but more highly colored than those of the northern part.

**[Agricultural engineering studies at the Alabama Experiment Station]** Alabama Station (Auburn) Report 1927, pp. 21-23).—In a continuation of the study of the fundamental factors influencing the traction of wheel tractors, by J. W. Randolph and M. L. Nichols, correlations were established between laboratory data and field results with actual tractors. In plaster cast studies of force distribution in soils a comparatively close check was obtained between calculated and actual distortion. The weight on the wheel and the depth of the lug are functions of the direction and amount of soil distortion. Shear in the soil takes place perpendicularly to the resultant of lug and rim displacement. By taking advantage of the arch action of the soil the lines of shear can be given greater distortion through the soil, resulting in a greater drawbar pull by the tractor.

Studies, by Nichols, of the physical properties of the soil as they affect tillage implement design showed that the adhesive properties of the metal could be varied by various heat treatments. Rapid cooling in mercury gave the lowest adhesion.

An electric sterilizer for dairy utensils was developed by Nichols, consisting of a float which could be attached to a Bayonet heater and which kept the heating coil immersed, thus giving a minimum amount of water to be heated and a maximum of steam.

In studies of solar water heating, A. Carnes developed a device which uses the energy of the sun for heating water for household and dairy purposes. This consists of three 30-by-60-inch sections built of corrugated roofing riveted to flat roofing and so arranged that the water would pass between the two middle surfaces. The heater was covered with glass. The heated water was stored in a gravity tank of 500 gallons capacity. The water temperature obtained in the months of August, September, and October ranged from 90 to 150 degrees F., providing water in sufficient quantities for the use of a dairy of 30 cows.

In studies of the requirements of farm machinery, Nichols found that the requirements of a riding cultivator are that the pipe gang is best adapted to the plants grown on a bed or in the water furrows, as it permits adjustments for "dirtling" in the same manner as the Georgia Stock. The further requirements for the riding cultivator are that it should have a fairly high wheel, and, preferably, pivot axle control. It was found that the walking cultivators used in this section have the required adjustments, which were lacking in many of the riding cultivators.

Labor studies showed that next to the cultivator the combination planter and fertilizer distributor was the most valuable tool. The requirements of agriculture were best met by the Lister type planter developed for southwestern conditions.

**The Value of Inert Gas as a preventive of Dust Explosions in Grinding Equipment.** H. R. Brown (U. S. Department of Agriculture, Technical Bulletin 74 (1928), pp. 24, figs. 6).—As a result of the experimental work and the observations made during actual operation of inert gas systems in industrial plants, the value of inert gas as a means of preventing dust explosions has been so well demonstrated that its use should be seriously considered wherever an explosion hazard exists

which can not be controlled through the elimination of the dust cloud or the source of ignition. The use of inert gas is particularly recommended in grinding, bolting, or any phase of a manufacturing process where an explosive dust is produced or handled within an inclosed piece of equipment. In the experiments two fires were extinguished by flooding the inclosure with flue gas. Inert gas, especially carbon dioxide, was found to have many advantages over other fire-fighting mediums since it will not injure metals, fabrics, food products, or other perishable materials.

**[Agricultural Engineering Studies at the Nebraska Station]** (Nebraska Station (Lincoln) Rpt. (1927), pp. 8, 9).—The progress results of studies on poultry house ventilation and construction indicate that the addition of neither a small house fan nor an exhaust fan to the ventilation system resulted in increased egg production. There was a general falling off of egg production in all houses during extremely cold weather and only a slight increase where houses were artificially heated.

Brief data are also reported on the farm use of wind-driven electrical plants.

**Terretfield Automatic Sheep-Feeder.** F. E. Waddy, South Australia Department of Agriculture (Turretfield, South Australia) Bulletin 213 (1927), pp. 7, figs. 5).—An automatic sheep-feeder, developed at the Turretfield Demonstration Farm in South Australia, is described and illustrated.

**Agricultural Engineering.** M. J. Thompson (Minnesota Station (St. Paul) Duluth Substation Report 1926-1927, p. 40).—Data are briefly reported on land clearing of stumps and stones and on the use of wind power for pumping water.

**Shrinkage of Boards of Douglas Fir, Western Yellow Pine, and the Southern Pines.** E. C. Peck (Amer. Lumberman (Chicago) No. 2774 (1928), pp. 52-54, figs. 7).—Results of studies conducted by the U. S. D. A. Forest Service are briefly reported in graphic form. Special attention is drawn to the data on the relation of moisture content to shrinkage in longleaf pine, shortleaf and loblolly pine, western yellow pine, and Coast Douglas fir. They show that the shrinkage rate is low at first, then high and then low again. It is highest in the general vicinity of a moisture content of 12 per cent. In most cases the data indicate a slight shrinkage of the piece as an entirety before the average moisture content reaches the fiber saturation point.

The total radial shrinkage is approximately 75 per cent of the tangential shrinkage. The range in tangential shrinkage is from 5.5 per cent in both heartwood and sapwood of western yellow pine to 7.2 per cent in longleaf heartwood. The range in radial shrinkage is from 3.9 per cent in western yellow pine sapwood to 5.4 per cent in longleaf sapwood.

**Heating and Ventilation.** H. Rietschel and C. W. Brabbee, trans. by C. W. Brabbee (New York and London: McGraw-Hill Book Co., 1927, pp. XI + 332, figs. 188).—This is the first English edition of this book, which has been translated from the seventh German edition. It contains parts on heating, ventilation, the design of heating systems, and ventilation systems, together with a large amount of tabular working data.

**Cements, Limes and Plasters.** E. C. Eckel (New York: John Wiley & Sons; London: Chapman & Hall, 1928, 3 ed., pp. XXXIV + 699, pls. 5, figs. 156).—This is the third edition of this book which presents information on cements, limes and plasters and their materials, manufacture and properties.

**Air-Cooled Apple Storages.** C. E. Baker (Indiana Station (LaFayette) Circular 154 (1928), pp. 24, figs. 19).—The results of studies on the air cooling of apple storages are summarized and discussed in a practical manner. Air-cooled storages may take the form of a cellar or they may be constructed entirely above the ground. In either case they should be well insulated to keep the fruit cool during early fall and to protect against freezing during severe winter weather.

Cooling is accomplished by moving large quantities of air through the storage, taking the cool air in at the lowest part of the building and removing the warm air from the upper part. The air intake openings must be large and numerous and the outlet flues should also be of large size. A slatted false floor generally is used to permit the circulation of air beneath the fruit. With a dirt floor sufficient relative humidity is

usually maintained to prevent the fruit from shriveling. With a concrete floor it frequently becomes necessary to add moisture to maintain a satisfactory humidity.

Medium-sized fruit has been found to stand up better in storage than large, overgrown fruit, and ventilated bushel crates make the most desirable storage containers.

Eight air-cooled storages of different types and from different sections of Indiana are illustrated and described.

**Unit System for Farm Buildings**, G. S. Henderson (Agricultural Research Institute, Pusa, (Calcutta) Bulletin 174 (1928), pp. 3, pls. 3, figs. 3).—Unit system farm buildings as developed in India for experiment stations and farms are described and diagrammatically illustrated. The use of rolled steel beam columns and of steel members has been found successful and practical.

General specifications for one unit of a portable shed are presented.

**The L-Block: A Type of Concrete Block Adapted to the Economical Construction of Farm Buildings**, J. B. Davidson and H. Glese (Iowa Station (Ames) Bulletin 249 (1928), pp. 225-247, figs. 26).—Practical information on the manufacture and use of the L-block, with particular reference to dwellings and farm buildings, is presented, together with working drawings.

**Electric Service for Light, Heat, and Power**, T. E. Henton and M. Rapp, Indiana Station (La Fayette) Circular 157 (1928), pp. 24 + 4, figs. 37).—Practical information on the application of electricity to farm and household uses is presented. Electric power has been found practical in operating the water pump, milking machine, cream separator, feed grinder, ensilage cutter, dairy refrigerator, grain elevator, bottle washer, sheep-shearing machine, grindstone, fanning mill, fruit grader and other equipment. In the home it operates the washer, vacuum cleaner, refrigerator, churn, sewing machine, ironer, and many other electrical appliances.

The results of three and one-half years of intensive effort to determine the value and economy of using electricity on the farm are reported as having been completed.

**Electro-Farming**, R. B. Matthews (London: Ernest Benn, 1928, pp. XVII + 357, figs. 162).—This book is based on British experience in the use of electricity in agricultural practice. It contains chapters on electrofarming; the power station and the agricultural load; private electric generating plants; agricultural electric motor drives; systems of overhead transmission; electrofarming in other countries; rural industries; wiring and lighting of farm buildings; electric plowing; harvesting; handling crops; threshing; electrosilage; electroculture and light treatment; irrigation, pumping and liquid manure distribution; electricity on the poultry farm; electricity on the dairy farm; bees; and applications of electricity in the homestead.

**Building an Electric Dairy Cold Storage**, W. T. Ackerman (New Hampshire University (Durham) [Agriculture] Extension Circular 85 (1928), pp. 15, figs. 7).—Practical information on the construction of an electrical refrigerating apparatus for use in dairies is presented.

**Electric Heating**, E. A. Wilcox (New York and London: McGraw-Hill Book Co., 1928, pp. VIII + 469, figs. 152).—This book contains chapters on fundamentals of heat; electrical fundamentals; resistor elements and heating units; cooking; water heating; air heating, oven heating; heating furnaces; iron- and steel-melting furnaces; brass melting furnaces; high-frequency furnaces; pot furnaces; miscellaneous furnace applications; arc welding; resistance welding; metal heaters; sterilizers, stills, and steam boilers; liquid heating and compound melting pots; incubators and brooders; miscellaneous heating appliances; metal coatings; temperature measurement and control; and thermal insulation.

**Electric Motor Drives Elevator and Grinder**, O. E. Robey (Michigan Station (East Lansing) Quarterly Bulletin, 11 (1928), No. 1, pp. 32, 33, fig. 1).—Data on the use of an electric motor for the operation of an elevator and grinder are briefly presented, together with a diagrammatic illustration of the bins and machinery.

**Resistance of Portland Cement Concrete to the Action of Sulphate Waters as Influenced by the Cement**, D. G. Miller (U. S. Department of Agriculture, Public Roads, 9 (1928), No. 4, pp. 82-87, 92, figs. 7).—This is a progress report of studies being conducted in cooperation with the Minnesota Experiment Station. It was found that standard portland cements from different manufacturing plants may vary greatly in resistance to the action of sulfate waters. Under the same exposure conditions the more resistant cements have outlived those of least resistance by as much as eight times. Portland cements that failed quickly in the laboratory in pure solutions of sodium sulfate ordinarily displayed low resistance in the field to the action of mixed salts. The most desirable portland cements for concrete were found to be those that proved most resistant to the action of both pure salts and mixed salts. The results of standard physical tests and of standard chemical analysis of portland cements gave no indications of resistance to sulfate waters. It is thought that the geological differences of the

raw materials of different cements may possibly be one factor that must be considered in attempting to account for differences in resistance to sulfate waters.

**Farm Buildings**, W. A. Foster and D. G. Carter (New York: John Wiley & Sons; London: Chapman & Hall, 1928, 2. ed., pp. XVIII + 358, figs. 300).—This is the second edition of this book, which has been rewritten and reset, and the subject matter revised to conform to the newer knowledge in the field of farm structures. Many chapters have been entirely rewritten. Chapters are now included on plan drawing, farmstead planning, wood and frame building materials, cement and concrete, other masonry materials, cost estimating, farm building construction, framing and roof construction, mechanics of farm buildings, poultry houses, hog houses, hoghouse sanitation, storage buildings, silos, implement and machine shelters, farm barns, the dairy barn, the horse barn, other special-purpose barns, general-purpose barns, ventilation, the farm home, built-in equipment and home utilities, planning the farmhouse, farmhouse construction, specifications and codes, and reference tables for farm-building design.

The appendix includes a selected list of references, valuable as a supplement to the book.

**An Apparatus for Adding Gypsum to Irrigation Water**, C. S. Scofield and E. W. Knight (U. S. Department of Agriculture, Department Circular 38 (1928), pp. 6, figs. 2).—A description is given of a device for adding gypsum to irrigation water. It is made chiefly of galvanized sheet iron and consists of a hopper, a revolving feeding device, a submerged stirring device, and a paddle wheel driven by the irrigation stream to actuate the feeding and stirring devices. The results of tests of the machine are also recorded.

## Book Review

"The Economics of Farm Relief," by Edwin R. A. Seligman, is the contribution of a widely known economist to this popular question. It is the result of a study made by the author last summer at the request, and presumably for the guidance of, Democratic Party leaders. This, however, does not detract from the Doctor's detached viewpoint or the value of the book from the standpoint of economic science. It recognizes the complexity of the matter with which it deals that government cannot reverse the operation of economic law, and that for the conditions which exist, there is no specific which can be sugar-coated, quickly administered and allopathic in effect. The agricultural engineer will find it an interesting scholastic bush with the usual amount of brush bearing a fair crop of roses and thorns. It is published by the Columbia University Press and the price is \$3.00.

"Agricultural Surveying and Drainage Laboratory Manual," by D. Scoates, is brought up to date in the fifth edition which is now available. It is written primarily for agricultural college students and gives stress only to matters essential to a thorough understanding of the surveying needs of the farm. In four distinct parts the booklet gives assignments, sample pages showing how the work is to be written up, blank note pages, and information and tables. The seventeen exercises cover estimating, chaining, determining angles, computing areas, laying out buildings, leveling, reading angles, topographical surveying, drainage, and terracing. Paper covers, 118 pages, 4 1/4 x 6 3/4 inches. Available in quantity at 55 cents per copy f.o.b. from the author, D. Scoates, Head, Agricultural Engineering Department, A. & M. College of Texas, College Station, Texas.

"Farm Products in Industry," by George M. Rommel, is claimed to be the first book ever printed on cornstalk paper. An excellent job of printing is done on the 318 text pages which have an antique finish, and 31 half-tones on coated cornstalk paper show up well. The subject matter is based on a study conducted by the author for the U. S. Department of Agriculture, in 1927-28. The economics of waste and consumption, the livestock industry as an example of by-products utilization, sources of cellulose, corn as a source of cellulose, the value of cornstalks to manufacturers and to farmers, wastes from other farm crops and the possibilities of organic chemistry in promoting farm waste utilization are covered in the fourteen chapters. A bibliography and an appendix containing statistical data supplement the text. The Rae D. Henkle Co., New York, publishes the book and lists it at \$3.50.

"Buyer's Guide" (1929 edition) has just been issued by the "Farm Implement News," Chicago. This is a directory of farm equipment manufacturers of the United States. The principal divisions include a classified list of manufacturers, an alphabetical list of manufacturers, a general directory of manufacturers arranged by states and post offices, and also a directory of branch houses, jobbers and distributors. The directory has been thoroughly revised and more than 6500 changes were made from the 1928 edition. Price per copy \$2.00 postpaid.

# AGRICULTURAL ENGINEERING

Established 1920

A journal devoted to the advancement of the theory and practice of engineering as applied to agriculture and of the allied arts and sciences. Published monthly by the American Society of Agricultural Engineers, under the direction of the Publications Committee.

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Contributions of interest and value, especially on new developments in the field of agricultural engineering, are invited for publication in this journal. Its columns are open for discussions on all phases of agricultural engineering. Communications on subjects of timely interest to agricultural engineers, or comments on the contents of this journal or the activities of the Society, are also welcome.

Original articles, papers, discussions, and reports may be reprinted from this publication, provided proper credit is given.

RAYMOND OLNEY, Editor

## Bascom B. Clarke

**D**URING the closing days of the year 1907, a handful of instructors in agricultural engineering at the state agricultural colleges and universities met in the agricultural engineering building at the University of Wisconsin, at Madison, for the purpose of exchanging ideas and in a general way advancing the field of work in which they were engaged. They discussed the advisability of organizing a little association as a means of maintaining desirable contacts between each other and promoting their professional interests. They had not, however, considered launching a national society of agricultural engineers; perhaps they felt the time was not then ripe for such a move.

It remained for Bascom B. Clarke, a veteran in organization work, to foresee the possibilities of a national agricultural engineering society, and with his characteristic enthusiasm and forcefulness he won the little group to his point of view. J. B. Davidson, the first president of the American Society of Agricultural Engineers, says of him in this connection: "Mr. Clarke made very definite contribution to the Society at its organization meeting. He seemed to have a vision of the place that a society such as ours might make for itself. As we discussed the name that we might choose for our society and the work it might do, there was considerable hesitancy displayed. At the strategic moment Mr. Clarke made one of his stirring speeches in which he declared that we could be anything we set out to be and that it would be a mistake to choose any name which would not represent the highest standard and purpose to which we could possibly aspire. His speech came just at the right time, and it was immediately voted that our society should be the 'American Society of Agricultural Engineers.'"

Mr. Clarke passed away on March 17. The agricultural engineering profession has lost one of its best friends. His vision and foresight back in 1907 gave the pioneers in agricultural engineering the inspiration and courage they needed to break through the wall of hesitation confronting them and found a national society that in turn would establish an agricultural engineering profession and that would foster in this field the development and

recognition which its workers sought and which agriculture needed.

All honor then to Bascom B. Clarke. The value of what he did in bringing about the establishment of the agricultural engineering profession cannot be overestimated. Agricultural engineers will ever revere his name and hold in grateful memory the important part he played in the founding of their national society.

## Farm Structures

**F**ARM structures, featured in this issue, are a highly important accessory to agricultural processes. They represent an investment second only to that in the land itself. But how much is really known about their value?

Consider, for example, the buildings which are a part of the farm plant, because their value—their net contribution to production—may be measured in dollars and cents. Their principal value is in the shelter, the controlled conditions, they provide for animals, machines, materials and processes of agricultural production.

Consider a production engineer in farm work. In analyzing his structures problems he would ask himself: (1) What animals, machines, materials, and processes will have a part in my annual production program? (2) How and to what extent will varying kinds and degrees of shelter affect their contribution to production? (3) How much and what kind of shelter will lead to the greatest net contribution to production?

The answer to the first question, as to how many cows, chickens or bushels of corn to provide for, is easily found in his proposed production program. But attempting to answer the second question may lead to disappointment. What must be provided shelter against—fire, weather, rodents, or sneak thieves? How important is each, considering the locality and the items to be sheltered? Should his shelter be 90 per cent of optimum, or would 70 per cent or 50 per cent be more profitable? And the third question, involving design, financing and operation problems, can scarcely be answered until the answer to his second question is known.

To restate the situation in other words, farmers are making their second largest investment upon only the most general knowledge of how and how much that investment may contribute to the overall efficiency of their farms. Specific knowledge simply is not available. It can be obtained only by research.

## Engineering or Farm Machinery

**A** PROMINENT agricultural economist in reviewing the various influences now at work calling for a reorganization of agriculture, emphasized at great length the influence of modern farm machinery. When asked why he did not refer to the influences of "engineering" in agriculture rather than "farm machinery," he said that he had never thought of it in that light.

Is it possible that the agricultural engineers are responsible for this situation? The engineer is a specialist in power and labor, and the function of machinery is to provide the means for applying power to various operations and thereby raising the efficiency of labor. In this sense machinery is only the evidence of engineering. Much engineering is required to design, develop and produce machinery, and an engineered program of production is needed before use can be made of farm machinery.

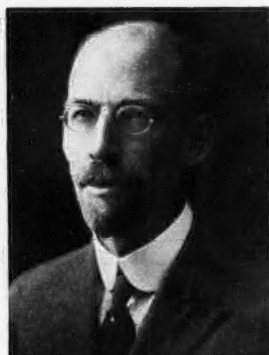
The economist admitted that it would be just as reasonable to speak of the subject of "cost accounting" in terms of "account books." Would we not do well to point out to our friends and other specialists that the important changes which are now taking place are due to the introduction of "engineering" into the industry of agriculture?

J. B. DAVIDSON

## Who's Who in Agricultural Engineering



C. D. Kinsman



H. W. Riley



J. C. Wooley



W. P. Miller

### C. D. Kinsman

Claude D. Kinsman (Mem. A.S.A.E.) is supervisor of harvester research for the Caterpillar Tractor Company. After receiving his bachelor's degree in agricultural engineering from the University of Nebraska in 1912 he went to Purdue University as instructor in farm mechanics. In 1916 he was made extension agricultural engineer and also received his master's degree. In 1918 the University of Nebraska reached out and drew him back to his home state as associate professor in agricultural engineering extension work. About a year later he went into consulting farm management and agricultural engineering work in Nebraska. The U.S.D.A. Division of Agricultural Engineering employed him in 1923 to direct a survey of the use of power in agriculture, which had been suggested by the Committee on the Relation of Electricity to Agriculture. His report on this survey, published as a U.S.D.A. bulletin, ranks as a classic in agricultural engineering literature. On the completion of this survey he was retained by the Division as senior agricultural engineer in charge of farm power and machinery investigations. Early in 1927 he joined the organization of the Western Harvester Company. During recent years his work in the Society has been principally in the Power and Machinery Division.

### H. W. Riley

Howard Wait Riley (Charter Mem. A.S.A.E.) is professor and head of the department of farm mechanics at Cornell University, and owner and operator of a dairy farm near Ithaca, New York. He was graduated as a mechanical engineer from Sibley College, Cornell University, in 1901. Positions he has held since that time include chief designer for the United Telpherage Company, New York City, 1901-1904; engineer with the Morse Chain Company, Ithaca, New York, 1904-1906; laboratory instructor in mechanical engineering, Cornell University, 1906-1907; and instructor in charge of the department of farm mechanics, Cornell University beginning in 1907. Under his guidance the department has grown and he has advanced to the rank of professor. As one of the seventeen agricultural engineers who met at Madison, Wisconsin, in 1907 and organized the American Society of Agricultural Engineers, he is also the author of the first paper presented before the Society. He has served it continuously since that time as a member of various committees and by his contributions to its meetings and technical literature. He was its fifth president.

### J. C. Wooley

John Cochran Wooley (Mem. A.S.A.E.) is professor and head of the department of agricultural engineering at the University of Missouri. At present, however, he is on leave of absence and is conducting some research at the University of California leading to a doctor's degree. He is a graduate of Iowa State Teachers College; spent several years as superintendent of the consolidated schools of Crawfordsville, Iowa, his home town; and several years as principal of the Iowa Falls High School. In 1913, however, he went to Iowa State College to study agricultural engineering, and received his bachelor's degree in 1917. After graduating he remained with the department at Iowa State College as instructor in agricultural engineering extension work until the following September. Then he went to the University of Idaho as professor of agricultural engineering. In 1920 he accepted his present position. He is author of a number of bulletins and of articles in AGRICULTURAL ENGINEERING. His knowledge and experience cover all of the technical branches of agricultural engineering and he is therefore especially well prepared for the work of directing his department.

### W. P. Miller

Wendell Pierson Miller (Mem. A.S.A.E.) is head of Wendell P. Miller and Associates, engineers and constructors, of Columbus, Ohio. As an undergraduate at Ohio State University he, in company with the late F. W. Ives and a few other men, organized a consulting agricultural engineering service in 1918. This organization, practicing general agricultural engineering and specializing in estate development and farm management, continued in business until 1920. Then Mr. Miller, having received his bachelor's degree in 1919, became extension specialist with the agricultural engineering department at Ohio State University. In 1924 he resigned this position to again enter private practice. His present organization, including himself and five associated specialists, specializes in drainage, irrigation and soil conditioning and maintains offices in Chicago and Los Angeles as well as in Columbus. Its work includes making surveys and designs, construction, construction supervision and surface maintenance. A good deal of the work is done on golf links, polo grounds, airports, etc. Mr. Miller has served on a number of committees of the Society and has been especially active in the reclamation group.

## A. S. A. E. and Related Activities

### General Sessions and Entertainment to be Features of Twenty-Third Annual Meeting

**S**OIL erosion, cotton harvesting, refrigeration and some farm structures subject yet to be chosen will be featured in the general sessions as the subjects of greatest interest to agricultural engineers when the American Society of Agricultural Engineers meets at Dallas during the last week of June. The general sessions are to be held on Tuesday and Wednesday, June 25 and 26, following the College Division session on Monday.

President William Boss will give the president's annual address when the meeting has been formally opened Tuesday morning. Soil erosion and water conservation facts from two different experiment station projects will be presented by the men in charge of them, and will be discussed during the remainder of the morning.

"The U.S.D.A. Soil Erosion Projects," "The Texas Problem of Silt in Streams and Reservoirs," "The Banks and Soil Erosion" and "Selling Texas on Terracing" are other erosion topics tentatively scheduled. Cotton harvesting, with papers on "The Problem of the Development of a Mechanical Cotton Picker," "The Cotton Stripper and its Problems," "The Cotton Breeder and the Mechanical Harvesting of Cotton" and "The Gins and Present Day Cotton Harvesting" are slated for Wednesday forenoon.

The contributions on refrigeration will be papers on mechanical refrigerators for farm dairies and farm homes, and of special interest, one on "The Mechanical Cooling of Homes."

"Where Are We Today in Agricultural Engineering?" is a question to be answered by the concluding paper on the general program.

Cotton dusting by airplane will be demonstrated Thursday morning when cotton machinery will be inspected and demonstrated. The government has already promised airplanes for the dusting demonstration.

Southwestern music and southwestern food will be the entertainment features of the meeting. Music lovers will especially want to attend the complimentary musical Monday evening when Mexican music will be played by a real Mexican orchestra as the first part of the program. For the second part of the program, John Lommox, the world's leading authority on cowboy ballads, will be present to talk about these ballads and tell some of the interesting experiences he had in collecting them. He will have a cowboy with him to sing some of them.

This program will be broadcast by radio station WFAA, as will some others during the meeting. This station, which has its studios in the Baker Hotel where the meeting will be held, will cooperate to the fullest extent in making it a success.

Southern delicacies to appeal to the most epicurean and a colored chorus to sing the old negro spirituals during the meal have been planned for the annual banquet Wednesday evening in the hope of outdoing all previous banquets of the Society. The outstanding humorist of the Southwest for the principal speaker, unusual favors, and dancing following the banquet are promised as additional attractions to this event of the Society year.

Appetites worked up on the field demonstration and inspection trip Thursday morning will be satisfied at a genuine southwestern barbeque and watermelon cutting through the courtesy of the Farm and Ranch Publishing Company.

Special entertainment for the ladies and for the chil-

dren is being arranged. The local committee has mustered the best facilities of Dallas, the Lone Star state, and the whole Southwest to make every minute of the meeting and the visit to Dallas a delight to everyone.

### North Central Section Meets in May

**A**N UNUSUALLY strong sectional program has been planned for the third meeting of the North Central Section of the American Society of Agricultural Engineers to be held at North Dakota Agricultural College, Fargo, on Friday evening, May 3, and Saturday, May 4.

Broadcasting from the college radio station will be the feature of the Friday evening program. The station has granted the section forty-five minutes in which to broadcast a story of the history and activities of the Society.

Chairman E. M. Mervine, agricultural engineer, Iowa State College, will formally open the meeting at 9 o'clock Saturday morning. Dr. John Lee Coulter, president of North Dakota Agricultural College, will then extend a welcome to the group.

One hour each has been allotted to the reclamation, structures, and rural electrification interests to present and discuss the major problems of the Section along those lines. H. B. Roe, agricultural engineer, University of Minnesota, will lead the reclamation hour and H. B. White, agricultural engineer, University of Minnesota, will lead the structures hour. A leader for the rural electrification hour will be selected in the near future.

After luncheon an hour and a half allotted to the power and machinery representatives of the Section will be devoted to the question of weed control. It is also expected that the matter of weed control will be given major attention by the reclamation men in their contribution to the morning's program.

Another hour in the afternoon has been allotted to the interests of the College Division and will be devoted exclusively to the matter of "Farms for Agricultural Engineering Departments." Chairman Mervine will lead the discussion.

A brief business meeting of the Section and tours of the college campus are planned to occupy the time between 4:30 and 6:15 p.m. At that time a dinner will be held. The main feature for the short evening program following the dinner will be an address by William Boss, president of the Society.

At 8:45 p.m. those present will be free to follow their own inclinations as to further conferences and entertainment.

### College Division Election

**E**ACH year two members of the Advisory Committee of the College Division of the American Society of Agricultural Engineers, to serve two years, are elected by the departments of agricultural engineering of the state agricultural colleges and universities, in which the head of the department is a member of the Society.

In the annual election just closed, the two members elected to places on the committee, beginning at the close of the annual meeting of the Society in June, are F. C. Fenton, professor of agricultural engineering and head of the department at Kansas State Agricultural College, and C. E. Seitz, professor of agricultural engineering and head of the department at Virginia Polytechnic Institute.

## Bascom B. Clarke



**B**ASCOM B. Clarke, 77, president of the Clarke Publishing Company, Madison, Wisconsin, charter member and first honorary member of the American Society of Agricultural Engineers, noted publisher, writer

and philanthropist, and thirty-third degree Mason, passed away suddenly on March 17.

Mr. Clarke was one of the group of less than twenty agricultural engineers who met in the agricultural engineering building at the University of Wisconsin, in December 1907, and organized the American Society of Agricultural Engineers. At that meeting he gave an address, entitled "The Importance of Traction Engineers Having the Proper Education." Others present recall particularly his high ideals and aspirations for the new organization, broad vision of its field, influence in the choosing of its present name, and the banquet he tendered them in honor of the occasion. He was the first man elected by the organization to its honorary membership.

Virginia born, emigrated to Arkansas, orphaned at eleven, adopted and taken North by Union soldiers, earning his board and small wages, first on a farm and then as a drug store clerk at Colfax, Indiana, becoming postmaster, local publisher and implement salesman, Mr. Clarke laid a broad foundation for the constantly growing personality, friendships and good works for which he was widely known in his later years. From 1882 to 1898 he was in implement sales work with the Robinson, William Deering, C. Aultman and Port Huron companies. In 1898 he combined his experience in the farm implement and the publishing fields by starting the publication "American Thresherman," of which he has since continuously served as editor and publisher. The quality of his character and work has been well and briefly indicated by calling him "a modern Benjamin Franklin."

Mrs. Clarke and two sons, Frank Clarke, of Marcellus, Michigan, and James L. Clarke, treasurer of the Clarke Publishing Company, survive.

### Grade Marking of Lumber

**O**F PARTICULAR interest to agricultural users of lumber is the movement being instituted by the lumber industry for the grade marking of lumber. It is one of the most outstanding services the industry has ever put into effect. It will assure to the customer the quality, kind and dimensions which he specifies. President Herbert Hoover has said, "The grade marking of lumber is an excellent idea. It will tend not only toward a more economical distribution, but it is a big step toward better merchandising and will directly benefit the manufacturer, middle man, and consumer."

The grade marking of lumber is an important means of protection to non-technical lumber consumers who heretofore have found it difficult, if not impossible to check up on their lumber purchases. This system calls for the marking of each piece of lumber as it leaves the mill with symbols showing clearly and plainly the grade in which it falls. In this way substitution of grades, fraudulent or otherwise, will be prevented. Many other commodities are grade marked for the consumer's protection, but up to the present time lumber consumers have not enjoyed this advantage.

Special efforts are being made by the lumber industry in applying the grade-marking system to lumber produced in accordance with American Lumber Standards. These standards were originally developed and are advocated by the National Committee on Wood Utilization of the U.S. Department of Commerce, which is composed of manufacturers, distributors and consumers of forest

products, and they have been generally adopted by the lumber industry. The Committee, whose headquarters is in the Department of Commerce in Washington, recently issued a bulletin, entitled "Grade Marking of Lumber for the Consumer's Protection," copies of which will be sent on request.

### Rural Fire Departments

The National Fire Protection Association, 60 Batter-march St., Boston, Mass., has just released a report of its Committee on Farm Fire Protection, entitled "Rural Fire Departments." This report is in two parts, the first part dealing with specifications for fire-fighting apparatus and the second with department organization, personnel, duties, alarms, drills, etc. This is a tentative report and is put out in printed form for the purpose of securing comments and criticisms prior to further committee action and final adoption in May 1929.

### Wanted--Vols. I to VII Inclusive of Agricultural Engineering

**T**HE Unversum Book Export Company, Inc., 152 West 42nd Street, New York, N. Y., desires to obtain Vols. 1 to 7, inclusive, of AGRICULTURAL ENGINEERING, the journal of the American Society of Agricultural Engineers. Members of the Society and other readers having any or all of these volumes and wishing to dispose of them should write to the above-named company.

## Farm Building Conference Held

**R**etail building materials dealers of the vicinity and agricultural college specialists at the State College of Washington, at Pullman, gave March 21 and 23 to a consideration of farm structures problems.

L. J. Smith, head of the department of agricultural engineering at the college, arranged the program at the suggestion of the Western Retail Lumbermen's Association. The college, through its president, E. O. Holland; dean of agriculture, E. C. Johnson, and various department heads; and the Western Retail Lumbermen's Association, "Timberman," the National Lumber Manufacturers Association, the West Coast Lumbermen's Association and several lumber companies contributed to the success of the conference.

Housing requirements of sheep, beef cattle, dairy cattle, hogs and poultry were discussed during the first afternoon of the meeting by the college specialists in those classes of livestock. L. J. Smith talked on "The Fundamentals of Farm Concrete Construction" and on the following morning gave an illustrated lecture on "Planning the Farm Home." C. C. Johnson, agricultural engineer, Washington State College, talked on "Housing Farm Machinery."

A feature of the meeting was the banquet on the evening of the first day, at which Dr. E. A. Bryan, research professor of economics and history at the college, addressed the group on "The Development of the Lumber Industry in the Northwest."

"Types of Architecture for the Farm Home" and "The Preservation of Western Woods" were other subjects on the program. An inspection of farm buildings of the college, a noon luncheon on the second day, and a round table discussion were also held.

More than fifty people, mostly representatives of the local lumber yards, attended. Many of them before leaving expressed the hope that similar conferences would be held in the future.

## President Boss Appointed on A.E.C. Committee

**P**RESIDENT WILLIAM BOSS, of the American Society of Agricultural Engineers, has been appointed to serve as chairman of the Committee on Reforestation of American Engineering Council, and a member of the Committee on Program in Research of the Council.

## New A.S.A.E. Members

L. N. Aginsky, chief agricultural engineer, Grain Trust of the U.S.S.R., Moscow, U.S.S.R.

G. G. Burlingame, president, Burlingame, Hutchins & King, Inc., New York, N. Y.

R. R. Choate, agricultural engineer, Appalachian Electric Power Co., Roanoke, Va.

Douglas Dow, farm service advisor, The Detroit Edison Co., Detroit, Mich.

Jesse M. Dowell, farm manager, Do-Well Agricultural Service, Champaign, Ill.

Fred E. Gordon, manager, Antler Land Co., Wyola, Mont.

Lawrence C. Moore, graduate assistant in agricultural engineering, Michigan State College, East Lansing, Mich.

George B. Sherman, general manager, Ferguson-Sherman, Inc., Evansville, Ind.

A. B. Treyvas, assistant managing director, Machinery Experimental Station, Leningrad Agricultural Institute, Leningrad, U.S.S.R.

### Transfer of Grade

Ching Po Sun, agricultural engineer, Kiangsu Farm Implement Manufactory, Soochow, China. (Junior to Associate Member)

## Applicants for Membership

The following is a list of applicants for membership in the American Society of Agricultural Engineers received since the publication of the March issue of AGRICULTURAL ENGINEERING. Members of the Society are urged to send information relative to applicants for consideration of the Council prior to election.

L. C. Badgley, president, Badgley Implement Co., Boise, Idaho.

G. R. Brownback, rural salesman, Central Illinois Public Service Co., Canton, Ill.

C. H. Everett, salesman, John Deere Plow Co., Moline, Ill.

H. F. Griswold, factory superintendent, J. I. Case Threshing Machine Co., Racine, Wis.

Ove F. Jensen, assistant director, Northern Division, Soil Improvement Committee, National Fertilizer Association, Washington, D. C.

L. L. Koontz, graduate assistant, Virginia Polytechnic Institute, Blacksburg, Va.

V. L. Oliver, sales engineer, Twin City Separator Co., Fargo, N. D.

T. H. Oppenheim, secretary, New Idea Spreader Company, Coldwater, O.

L. H. Schoenleber, graduate student, Iowa State College, Ames, Ia.

H. E. Stover, rural salesman, Kansas Power and Light Co., Topeka, Kans.

H. K. Taylor, farm sales representative, Jeff Hunt Road Machinery Co., Columbia, S. C.

D. W. Teare, associate professor of agricultural engineering, Clemson Agricultural College, Clemson College, S. C.

### Transfer of Grade

R. H. Wileman, assistant in agricultural engineering, Purdue University Agricultural Experiment Station, Lafayette, Ind. (Junior to Associate Member.)

## Employment Bulletin

An employment service is conducted by the American Society of Agricultural Engineers for the special benefit of its members. Only Society members in good standing are privileged to insert notices in the "Men Available" section of this bulletin, and to apply for positions advertised in the "Positions Open" section. Non-members as well as members, seeking men to fill positions, for which members of the Society would be logical candidates, are privileged to insert notices in the "Positions Open" section and to be referred to persons listed in the "Men Available" section. Notices in both the "Men Available" and "Positions Open" sections will be inserted for one month only and will thereafter be discontinued, unless additional insertions are requested. Copy for notices must be received at the headquarters of the Society not later than the 20th of the month preceding date of issue. The form of notice should be such that the initial words indicate the classification. There is no charge for this service.

### Men Available

AGRICULTURAL ENGINEER, graduate of Mississippi A. & M. College and North Carolina State College of Agriculture, desires position in college work, either teaching, extension, or research. Has had teaching and extension experience for a period of nine years in southern agricultural institutions and for the past two years has handled work in drainage, irrigation, water supply and plumbing, machinery, building and repair work on a large demonstration farm in the South. MA-157

RURAL CONTACT SPECIALIST, a young man with large experience in rural community development and rural organization work and who thoroughly understands the farmers' problems, wishes a permanent connection with an electric power company in rural electrification work. A graduate in agriculture now employed by a power company in rural development work as public relations man in a rural community. MA-160.

AGRICULTURAL ENGINEER desiring advancement will consider position as manager of an agricultural enterprise where practical experience coupled with a college training will be appreciated. Has held positions with two of the leading agricultural colleges of the Middle West. Married and 39 years old. Prefer to locate in the Middle West. MA-162.

